



Everyone at the Table

Transforming Food Systems
by Connecting Science,
Policy and Society

Independent
Expert
Report



Research and
Innovation

Everyone at the Table: Transforming Food Systems by Connecting Science, Policy and Society

European Commission
Directorate-General for Research and Innovation
Directorate C — Healthy Planet
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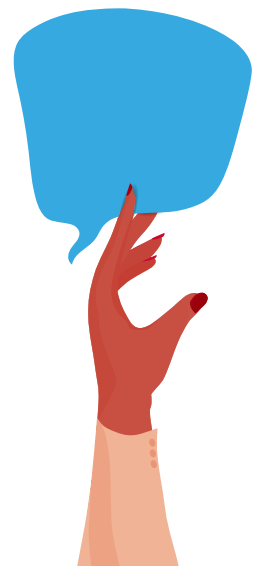
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ABBREVIATIONS

AIRCA	Association of International Research and Development Centers for Agriculture
Capnutra	Capacity Development Network in Nutrition in Central and Eastern Europe
CCAP	China Center for Agricultural Policy
CFPAC	Canadian Food Policy Advisory Council
CFS	Committee on World Food Security
EEA	European Environmental Agency
EFSA	European Food Safety Authority
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
FOLU	Food and Land Use Coalition
FORAGRO	Forum for the Americas on Agricultural Research and Technology Development
GFAR	Global Forum on Agricultural Research and Innovation
GHG	greenhouse gas
HLEG	high-level expert group
HLPE	High-Level Panel of Experts
IFPRI	International Food Policy Research Institute
IPBES	Intergovernmental Science–Policy Platform on Biodiversity and Ecosystem Services
IPCC	Intergovernmental Panel on Climate Change
ISAAA	International Service for the Acquisition of Agri–biotech Applications
JRC	Joint Research Centre
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
SAM	Scientific Advice Mechanism
SAPEA	Science Advice for Policy by European Academies
SCAR	Standing Committee on Agricultural Research
SDG	sustainable development goal
SPI	science–policy interface
SPSI	science–policy–society interface



SUMMARY

The European Commission established a High-Level Expert Group (HLEG) to assess the needs and options for strengthening science–policy interfaces for improved food systems governance¹. The HLEG concluded that food system transformation, needed more than ever due to the current food crisis triggered by the invasion of Ukraine, must be better supported through ambitious, interlinked science–policy–society interfaces. While elements of these interfaces exist, much more is needed. The HLEG makes the following recommendations:

- multilateral governance organisations, such as the European Commission and the UN, should fully adopt a food system lens in all their investments and activities – one that links food producers through to processors and consumers by empowering all relevant stakeholders, diverse voices and geographical regions;
- in adopting a food system lens, governance organisations, including national governments and regional bodies, should work collectively to connect stakeholders across all scales, convene regular multistakeholder dialogues, anticipate trends, set targets, articulate policy options, debate progress to fuel action at different levels and address trade-offs;
- in terms of the global community, the current landscape of science–policy–society interfaces must be strengthened to engage a wider range of voices, integrate data, anticipate trends and set targets and standards.

To support these ambitions, the HLEG proposes three pathways.

RECOMMENDED PATHWAY 1: adapt the current landscape to include additional resources and broader mandates. Multilateral governance (e.g. cooperation between the European Commission and the UN) should strengthen and adapt existing science–policy interfaces using additional resources and under a broader mandate for engagement across sectors and scales.

RECOMMENDED PATHWAY 2: enhance the current landscape with multisectoral task forces. Multilateral institutions should cooperate with participating countries to fund a series of dedicated task forces to fill knowledge and data gaps.

RECOMMENDED PATHWAY 3: coordinate agendas by creating a ‘network of networks’. The European Commission, the UN, UN agencies and other multilateral institutions should collectively invest in a global network coordination hub to build capacity, convene regional assessments, and develop forecasts and models to envision potential futures and identify trends.

¹ <https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?do=groupDetail&groupDetail&groupID=3739>

AUTHORSHIP

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PREFACE: THE HIGH-LEVEL EXPERT GROUP AND ITS SCOPE OF WORK

Launched in February 2021, the High-Level Expert Group (HLEG) to assess the needs and options for strengthening science–policy interfaces for improved food systems governance was tasked with advising the European Commission on the need, potential, feasibility and options regarding interfaces between science and other forms of evidence and policy to support food system transformation. The HLEG is an independent and diverse group of leading researchers with policy-relevant experiences, from around the world. They are committed to complete political independence and fulfilling their role with the highest ethical standards, professionalism and rigour. The group was tasked with assessing evidence and knowledge, examining the potential for enhancing existing institutions and/or networks and determining the kinds of funds and governance required to ensure legitimacy and impact. The terms of reference for the HLEG are as follows:

- **ADVISE** the European Commission on the need, gaps and options to strengthen the international ecosystems of science–policy interfaces to improve food system governance;
- **ASSESS** the potential impacts of options on informing food system governance and policy development (including for research and innovation) at multiple scales and on engaging stakeholders;
- **FOSTER** food system science diplomacy and dialogue towards the European Union being a global leader in transformation towards sustainability;
- **SUPPORT** the EU Green Deal policy priorities, including the EU farm-to-fork strategy.

The EU's experience in moving its policies towards more sustainable food systems is relevant to the global debate on food system transformation. Successive common agricultural policy reforms have sought to support 'the provision of public goods, such as safe and healthy food, nutrient management, response to climate change, protection of the environment and its contribution to the circular economy' (European Commission, 2017). Most recently, the European Commission's reflection paper Towards a Sustainable Europe by 2030 expressed a need for 'a comprehensive approach entailing a genuine change in the way we produce, transform, consume and distribute food by accelerating the transition to a sustainable food system based on circular economy principles and

making innovative, healthy, environment and animal welfare-friendly, safe and nutritious food production one of our key European trademarks' (European Commission, 2019).

Naturally, Europe cannot achieve these ambitious goals alone, and any transformative actions promoted by the European Commission and Member States of the European Union have implications for global agendas affecting regional and national levels. Furthermore, there is no suggestion that securing the best possible science-policy-society interface functions alone can achieve the transformation that is needed across the world's food systems. Science-policy-society interfaces represent one (critically important) element of influence for transformative actions to be pursued by national and local governments, businesses, civil society and citizens.

The outputs of the HLEG are meant to both inspire and inform the debate on how to strengthen the governance of food systems globally. The views expressed herein represent those of the HLEG members. The European Commission has no preconceived or preferred option(s) in terms of possible next steps.



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The High-Level Expert Group to assess the needs and options for strengthening science–policy interfaces for improved food systems governance is an independent and diverse group of leading researchers with policy-relevant experiences, from around the world. They are committed to complete political independence and fulfilling their role with the highest ethical standards, professionalism and rigour. They are part of this group in their capacity as individuals and hence their views do not represent the views of the organisations by which they are employed. The views expressed in this publication are the sole responsibility of the authors.

THE URGENCY OF FOOD SYSTEM TRANSFORMATION

Food policies have shifted in recent decades from being predominantly focused on increasing agricultural productivity and efficiency to taking account of a wider range of social and environmental concerns, including the links between diets and health and the need to reduce the impacts of food systems² on the environment. Historically, these issues have been treated in isolation as silos. The shift towards a more holistic approach has been underpinned by growing recognition that food systems are responsible for numerous interconnected societal challenges that must be met with proactive policy. Today's typical diets are often unhealthy and perceived to be unsustainable and inequitable. Suboptimal diets, underpinned by unsustainable food systems, are one of the leading drivers of disease (2021 Global Nutrition Report). Food systems contribute up to a third of human-generated greenhouse gas (GHG) emissions and cause loss or degradation of natural resources². Food systems are also at risk from climate change, environmental degradation, armed conflict, power imbalances and poor governance. The types of food we produce and consume, and how we manage food systems, have profound implications for the health of people and the planet itself.

Against this background, calls have emerged for sustainable food systems to become a central priority for national and international policy. A sustainable food system has been defined as 'one that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised' (HLPE on Food Security and Nutrition, 2014). More recently, the main function of a sustainable food system has been described as providing 'safe, nutritious and healthy food for all current and future citizens in a given territory without compromising the availability of and access to safe, nutritious and healthy food for current and future people living outside that territory' (SAPEA, 2020). Since today's food systems are far from fulfilling those core functions, the European Commission's food 2030 agenda underscores that:

a food system transformation is required which shifts towards more sustainable and healthy diets and aims to ensure food and nutrition security for all. This requires a better understanding of the interactions between the different components of the current food systems to maximise co-benefits, and to accelerate such a system-wide transformation.

EUROPEAN COMMISSION, 2020, p. 6

² We adopt the definition from the High-Level Panel of Experts on Food Security and Nutrition report on food systems (HLPE on Food Security and Nutrition, 2017): 'A food system gathers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the output of these activities, including socioeconomic and environmental outcomes.' This relates to all terrestrial and aquatic food systems.

Moving the idea of resilient and sustainable food systems towards political and policy change was advanced through four international meetings in 2021: the UN Food Systems Summit (UNFSS), the UN Biodiversity Conference (COP15, Part 1), the 2021 UN Climate Change Conference (COP26) under the UN Framework Convention on Climate Change, and the Nutrition for Growth Summit. The vision of the UNFSS was that ‘healthier, more sustainable, and more equitable food systems’ are necessary to achieve the UN’s sustainable development goals (SDGs) and the 2015 Paris Climate Agreement. Action is especially pressing since the world is off course to meet five of the six World Health Organization maternal, infant and young child nutrition targets and all diet-related non-communicable disease targets (2021 Global Nutrition Report).

But how can we nourish a world population expected to reach 10 billion by 2050, and simultaneously reduce global warming to meet the target of 1.5 °C above pre-industrial levels also by 2050? Recent progress on such fronts has been extremely disappointing. The invasion of Ukraine, which interrupted grain and vegetable oil supplies from the Black Sea region, followed on the heels of multiyear supply chain disruptions caused by the COVID-19 pandemic. The short-term implications of the Ukraine crisis are already manifest. Prices of key commodities such as wheat and sunflower oil have reached record levels. Fuel and fertiliser prices have sharply increased. There is uncertainty about crop production levels for Russia and Ukraine over the next 2 years. The combined impacts of these simultaneous crises are increasing extreme poverty and inequality, eroding food and nutrition security, and worsening economic and fiscal outlook in many countries. The most vulnerable countries are those in Africa already impacted by conflict and climate change which also have high imports from Russia and Ukraine. Countries in North Africa and the Middle East that are heavily dependent on food imports from Russia and Ukraine face a major increase in the cost of meeting their food requirements. This situation will require a major international response to tackle the short-term humanitarian crisis and the longer-term development challenges³. It seems likely that many countries and regions will seek to diversify their trading patterns to reduce their import dependence on Russia and Ukraine. They may also increase the political priority given to their own food and nutrition objectives.

In such a situation, the need for coherent policies will be of critical importance. Such policies should include measures to strengthen the future resilience of food systems to shocks of all kinds (European Commission, 2022; HLPF on Food Security and Nutrition, 2022). One aspect of ‘future-proofing’ food systems will involve refocusing actions and metrics on what matters most in ensuring healthy, nourished populations whose diets are derived in sustainable ways. For most of the 20th century, the performance of food systems was assessed on efficiency metrics linked to output per area of land under cultivation (on the supply side) and on the volume and price of calories available (on the demand side). These measures are too narrow. Food systems must deliver on human and planetary health: they must nourish people through high-quality diets in ways that are nature-positive and sustainable.

³ As part of that response, the World Bank is seeking to mobilise USD 50 billion to deal with the short-term response and a further USD 170 billion to tackle longer-term needs.

If these existential challenges have any chance of being met, there must be a step change in the political prioritisation, investment targets and governance relating to the functions of food systems as part of an ambitious transformative agenda (Béné, 2022). The UNFSS was politically significant because more than 100 countries committed to transforming their national food systems. Nevertheless, translating this commitment into reality will be challenging for most countries, many of which do not even have food or nutrition policies worthy of the name, let alone an adequately integrated policy framework to guide transformation across different sectoral domains.

A critical requirement for transformation will be to establish better links between and across the scientific⁴ community, policymakers, businesses, community members and political leaders. A recent report funded by the European Union noted that ‘the interface between science, technology and society is likely to become increasingly significant in policy debates about the future of food’ (SAPEA, 2020, p. 87). Similarly, the InterAcademy Partnership’s report on optimising science to support African development highlighted the importance of ‘ensuring the coordination of research funding initiatives to address priorities, building of capacity for interdisciplinary work and at the science–policy interface’ (InterAcademy Partnership, 2018, p. 8). In other words, it is widely understood that food system transformation must be based on the best knowledge and evidence being used to frame stakeholder dialogues that prioritise public and private sector actions. This calls for well-functioning and inclusive science–policy–society interfaces (SPSIs)⁵.

There is a growing consensus that the ecosystem of intelligence gathering, sharing and use that supports today’s policy agendas is not adequate and that business as usual cannot be an option. Scientific endeavours must produce more ‘socially robust knowledge’ (Nowotny, 2003, p. 151) that engages a wider range of stakeholders. Stakeholders must include those whose voices have rarely been heard, to provide not only context-sensitive, but also equitable, policy options. Indeed, there is a need to move beyond traditional unidirectional science–policy interfaces (SPIs) to novel SPSIs that can catalyse dynamic flows of information, evidence and insights to support impactful actions on the ground. This does not suggest a move away from the independent replicability of science-based evidence. Successful policy actions must be based on scientific rigour that is credible, relevant and impactful. However, there is a need to ground-truth ‘universal’ findings derived from science in multiple local contexts and to engage more deeply with holders of knowledge on traditional ecosystems and food traditions. SPSIs must also engage with industry and commercial food players. The challenge of bringing together such diverse perspectives in a way that is equitable and transparent represents a call not for less rigour but for more perceived and acknowledged relevance.

A recent survey of national data and policy gaps undertaken by the Food and Agriculture Organization of the United Nations (FAO) suggested several top priorities, including (a) peer-to-peer learning, (b) the collection and dissemination of policy-relevant knowledge,

⁴ Science can be defined as the systematic study of the world through observation and experimentation. This includes natural and social sciences, incorporating many disciplines and professional domains of expertise. The term ‘evidence’ is used in this report as an overarching concept that includes cutting-edge science (based on rigorous hypothesis testing and replication, involving both natural and social sciences of all kinds), but the relevance of experiential, indigenous and traditional knowledge is also recognised.

⁵ Conventional SPIs can be defined as ‘social processes which encompass relations between scientists and other actors in the policy process, and

and (c) monitoring and evaluation of policy actions (FAO, 2022). Some widely used stakeholder interface mechanisms already provide a range of relevant functions. Nevertheless, current institutions and forms of engagement are insufficient. A truly transformative agenda must include (a) clear pathways towards a paradigm shift, (b) cost-effective solutions that allow the world to move beyond today's obstacles, and (c) doing so in ways that contribute to, and draw on, collective intelligence of what matters and what works.

The central purpose of the High-Level Expert Group (HLEG) to assess the needs and options for strengthening science–policy interfaces for improved food systems governance has been to recommend a set of politically, scientifically and institutionally feasible options to address gaps identified in relation to existing entities, networks and processes. This requires spelling out the governance implications associated with recommendations that have potential to fuel multiscale food system transformation, in both the short term (to 2030) and the longer term (to 2050). A more explicit articulation is needed of the differences between science that can **inform** policy (but where the two domains are essentially separated) and science that **supports** policy and other kinds of investments through **co-creation** (where policy needs inform questions that, in turn, generate answers). Food system transformation requires both types of interaction: science that spells out what must be done and why, and implementation science that engages with policy processes to determine how things should be done and when.

The HLEG drew on recent thinking by the EU and other organisations around the world regarding ways of linking science to policy action. Options for the future have been examined: from accepting the status quo to creating new free-standing intergovernmental mechanisms. Each was assessed in terms of cost, time frame and legitimacy as well as in terms of its ability to support the urgent reforms needed.

There is much to build on. The next generation of SPSIs must augment existing institutional capacity to create a landscape empowered with more resources and more ambitious mandates so that efforts in one area reinforce those in another area (or at least do not counteract them or dilute their effects). There are many options available, some of which are recommended below, and action cannot be delayed.

which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making' (van den Hove, 2007, p. 807). The inclusion of 'society' emphasizes the need for appropriate engagement of marginalised and vulnerable groups relevant private sector food system actors, and a broader representation of civil society in processes from which many have been largely excluded.

PRINCIPLES AND FUNCTIONS OF EFFECTIVE SCIENCE–POLICY–SOCIETY INTERFACES FOR FOOD SYSTEM TRANSFORMATION

To bring about food system transformation, and thereby address major public health and planetary problems created by today's food systems, the best available evidence and knowledge must be marshalled in support of policymaking, business decisions and community-level investments. All too often, government decisions are held hostage to the short term, which is reflected in the prioritisation of increased food production. However, this approach has ignored associated environmental, public health and social costs. In the longer run, future generations will ultimately be presented with the real bill, which will reflect the 'true costs' of today's food – costs that can then be compared with the true value of sustainable food systems to humanity.

That said, better data alone will not ensure that policymakers avoid sacrificing long-term sustainability for the sake of short-term expediency. A recent report supporting the work of the European Commission's Group of Chief Scientific Advisors argued that the world has never had 'so much access to food-related knowledge. However, this knowledge and the collective capacities of the natural and social sciences are not yet fully mobilized to the benefit of a sustainability transition' (SAPEA, 2020, p. 124). Indeed, in a background brief for the UNFSS, Hainzelin et al. (2021, p. 1) argued that there is still a wide range 'of views regarding the role of science in the food system sector, marked by a polarity, and sometimes tension ... and an ongoing debate about legitimacy, excellence, and impact'. Hence, both improved information and societal engagement are needed.

Effective SPSIs of the future must act as platforms that facilitate networking and greater understanding, and must be based on principles of transparency, legitimacy, rigour and equity of process. SPSIs must also ensure engagement of all stakeholders, not only in discussing the interpretations of evidence but also in the policy process that determines which action pathways to pursue and to what ends (see Figure 1). Scientific and wider sets of knowledge must be valued to be

used appropriately. Information must be prepared and presented in such ways that policymakers and other stakeholders see that value. Evidence ‘mobilisation’ must, therefore, take place at multiple scales and across the entire food system, from farm to fork. Evidence from different policy domains must be calibrated, integrated and coherence-checked when applied to cross-scale problems. There are deep contextual aspects to consider in how gender and socioeconomic status can facilitate or hinder people’s access to (and inclusion in) the food system. Those who are excluded from decisions and benefits are more likely to be among those facing dietary inadequacy, hunger and lack of choice, and living in degraded and unsustainable environments. Thus, SPSIs of the future must articulate policy options in relation to potential distributional outcomes, assess the implications of choosing one policy pathway over others, judge the degree of scientific certainty and consensus relating to claims, and incorporate new evidence of ‘what works’ into the cycle of engagement among stakeholders.

Achieving such laudable ends, however, is fraught with complexity and difficulty. One review of sustainable food systems for the EU noted that, while there is broad consensus regarding the changes needed for a more just and sustainable food system, there is ‘much less agreement about how to achieve the desired changes’ (SAPEA, 2020, p. 26). For example, it is unclear how (and which) institutions can be empowered to translate knowledge into practice and document experiences such that lessons may be transferable to multiple audiences.

The European Commission’s Scientific Advice Mechanism (SAM) argued that previous scientific advice on how to achieve a sustainable food system ‘has not fully considered how the social sciences could be used to bring about a more sustainable food system’ (SAM, 2020, p. 7). To achieve a sustainable food system, the institutions, mechanisms and processes involved must be interdisciplinary (integrating multiple scientific disciplines), appropriately funded and open and transparent, and must empower dialogue among multiple food system actors (transdisciplinary). To be fully effective, SPSIs must articulate both the differences between, and the complementarities among, different types of knowledge and evidence, and anticipate trends at multiple scales to provide timely information.

Developing effective SPSIs also means incorporating and respecting traditional **ecological knowledge**, which often resides among indigenous or vulnerable communities or other marginalised groups with multigenerational and historical connections to the land, **scientific knowledge** that emerges from formal research programmes and **policy-relevant information**, which may be more anecdotal but based on a politically grounded understanding of what is feasible. As underscored by a recent report of the Global Commission on Evidence to Address Societal Challenges (2022, p. 69), ‘evidence is something that decision-makers can use, while research

is something that researchers do'. Therefore, SPSIs must be sensitive to the ways in which different types of knowledge and evidence can be mobilised and used (or manipulated) to make decisions and to inform dialogues and negotiations. SPSIs must also pay more attention to institutional inertia and path dependency, which can impede uptake of even the best evidence. Drawing on these high-level principles and aspirations, a global landscape of SPSIs should be based on a set of shared principles and should fulfil key functions to ensure that multiple perspectives and types of input and knowledge are gathered transparently and equitably.

PRINCIPLES

First, to effect meaningful transformation of today's food systems, SPSIs need to have **politically legitimate mandates** – that is, be rooted in a political structure or organisation with the authority, respect and legitimacy that are needed to act. This suggests that any amendments to the current landscape of global SPIs (such as funding secretariats to convene discussions around food system transformation) must be embedded in a multilateral organisation or system. Regional bodies may have their own legitimacy based on intergovernmental agreement, and these too would need to be enhanced in ways that retain their legitimacy.

Second, an effective ecosystem of institutions and mechanisms should involve the **participation of traditionally excluded and equity-seeking groups**, deliver evidence and concrete examples to which policymakers are receptive, generate evidence-supported actions and policy-driven demand for new science, and communicate to diverse target audiences. Legitimacy requires a commitment to independence, openness of the process and validation of findings after engagement of all stakeholders. This must be based on local, national, regional and global interaction, in addition to data sharing and openness regarding the methods used.

Third, and related, SPSIs must **be transparent and democratic** and work to reduce systemic barriers that traditionally prevent the participation of all relevant stakeholders. This requires SPSIs to direct resources to reduce the asymmetries of power and ensure full engagement. For example, access to travel funds, legal advice and capacity development is necessary to reduce barriers to participation⁶. SPSIs should provide support not only for people of various ethnic groups, but also for young people, older people and those who are illiterate (a disproportionate number of illiterate people are women).

Fourth, to be effective, SPSIs must have the **mandate and resources to work across scales and sectors**, hence the need to take a whole-of-food-system approach. Given the inherently local and intersectoral nature of food systems, SPSIs must be

⁶ Capacity development is a long-term process that empowers recipients to have agency. It encompasses human, institutional and legal framework resource development with the aim of enhancing knowledge and skills. In this context, agency can be defined as 'the capacity of individuals or groups to make their own decisions about what foods they eat, what foods they produce, how that food is produced, processed and distributed within food systems, and their ability to engage in processes that shape food system policies and governance' (HLPE on Food Security and Nutrition, 2020).

empowered and resourced to work in a transdisciplinary and multiscale context. One of the main challenges for transformation lies in the capacity to address contradictions and trade-offs across sectoral interests on the one hand, and across spatial and temporal scales on the other hand. Science should shed light on the consequences of, and potential conflicts inherent in, policy or investment decisions; that is, it should allow for transparent policy arbitration based on a clear understanding of obstacles, interests and consequences of multiple pathways. This must include understanding of how local changes may have global impacts and vice versa. The intersection between local food systems and global markets is critical and often controversial.

Fifth, SPSIs must be both **autonomous and rigorous**. In terms of protecting the autonomy of scientific processes, there are several very challenging tensions that must be resolved. For instance, given the role played by the commercial food sector in today's food systems, input into SPSIs by the private sector is necessary, but must be carefully circumscribed by appropriate safeguards. Indeed, there is a need for much greater contributions by the private sector to public good dimensions of SPSIs, including more open sharing of data on market patterns and trends, on drivers of price formation, on product research and on development prioritisation, and sharing of longer-term corporate strategies. Equally, the reports, assessments and recommendations that emerge from SPSIs must be free of political manipulation and potential 'greenwashing'. With regard to rigour, SPSIs face the challenging task of recognising that different sources of knowledge, including scientific research and traditional ecological knowledge, represent valuable inputs. This means that SPSIs must establish mechanisms that include conventional academic peer reviewing but must also be open to critiques and reflections by different types of societal knowledge holders over multiple phases of work.

Finally, there is a need to **define, measure and report on impacts**. National governments require pragmatic (costed) evidence on the likely effects of sets of priority actions, but it is equally important to document what actually happens, the real (although often unaccounted) costs of inaction and how things play out in practice. To achieve the desired processes and ends that underpin food system transformation, there is a need for significantly enhanced interactions among scientists (and other generators of evidence and insight), policymakers (and other stakeholders pursuing investments and other actions in the food domain) and society (individuals and communities who are primary actors in the overall food system) (see Box 1). Enhanced mechanisms are also needed to catalyse and support such interactions to ensure that SPSIs fulfil at least the six essential functions detailed on the next page.

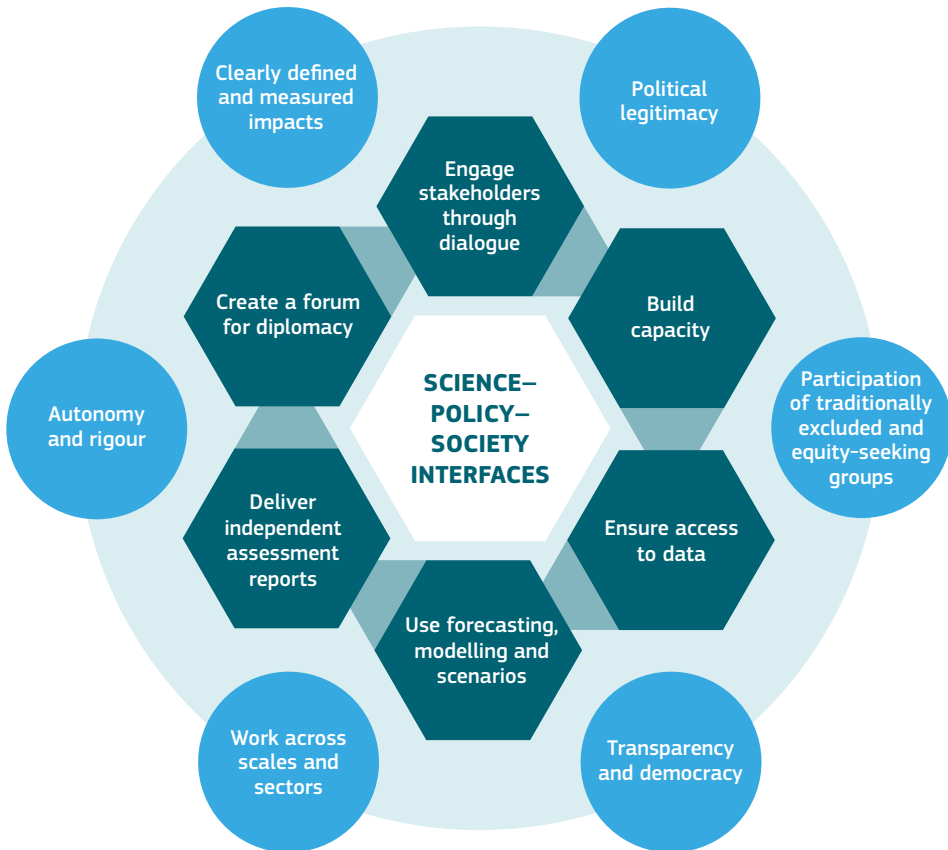


Figure 1. Principles and functions for SPSIs.
Blue circles denote principles; green hexagons show functions

ESSENTIAL FUNCTIONS

FUNCTION 1: Engage stakeholders through dialogue at multiple scales across the food system

A coordination mechanism, such as a secretariat or interlocutor, is needed to empower and foster dialogues that systematically engage non-state stakeholders from across food systems and co-create evidence agendas that identify needs, priorities, responsibilities and use. The expertise of food system actors is essential to ensure that challenges are adequately identified, including the political economy hurdles. It is also essential that policy recommendations derived from the collation of evidence will be perceived as legitimate by the full range of food system actors. Finally, such a

mechanism should allow the social innovations developed by food system actors to be considered (alongside technological innovations developed in research and development departments of large firms and public research centres) to expand the range of policy options presented to decision-makers. Ideally, such a science-policy intermediary would convene multistakeholder and multilevel conversations around priorities, concerns and the uptake of transferable lessons. This is a complex transdisciplinary agenda that requires understanding multiple lenses and perspectives.

Dialogues must actively engage with historically excluded groups. To be effective, this engagement must move beyond simply capturing knowledge to embrace and empower the constructive development of shared knowledge in ways that consider power dynamics and skills gaps. For indigenous groups, for example, this means that historical values related to food in a cultural and political sense must be recognised. Subnational governments are likely to play an important role in maintaining and enhancing local food systems, especially in countries in which indigenous peoples constitute a significant proportion of the population. Engaging honestly and effectively with such key groups of stakeholders entails addressing structural barriers that inhibit participation. One output of such a dialogue process would be the production of public-facing material as a way of creating a two-way conduit of engagement from the grassroots up to the multilateral level. A notable example of the emergence of this function is the national and independent food system dialogues convened as part of the lead-up to the UNFSS (*Box 1*).

BOX 1. Example of food system dialogues

In the lead-up to the UNFSS, national governments and independent institutions were encouraged to facilitate multistakeholder conversations around food system transformation. Over approximately 3 years, close to 2 000 individual dialogues took place, drawing on the input and expertise of over 100 000 participants. Over 111 'national pathway documents' were informed by the insights gathered through these food system engagements.

FUNCTION 2: Build capacity at national and local levels to translate evidence into impact

A lack of national and subnational institutional, human and financial capacities commonly impedes effectively engaging in global food system dialogues and interpreting relevant evidence. For example, a recent thematic analysis of recommendations from approximately 50 individual global commissions found that, although 242 recommendations were made relating to the supply of evidence (increased data collection and sharing, and improved flows of new evidence), rarely did any of these recommendations address how 'decision-makers can or should use evidence in addressing societal challenges' (Global Commission on Evidence to Address Societal Challenges, 2022).



Evidence is not usually universally relevant or axiomatically applicable to local contexts. Capacity must exist to access, digest and use evidence where it is most needed, and the right kinds of evidence and knowledge must be available to support decision-making from the local to the global scale. Effective SPSIs must define such capacities, identify where investments are needed and support local evidence-use systems. SPSIs should also articulate what staffing capabilities and partnerships are needed, and what science advisors or advisory bodies would be most appropriate, and define reportable metrics that can measure when and how evidence is used to generate public goods (*Box 2*). Furthermore, SPSIs should catalyse global and local institutional capacity building to ensure that knowledge generation supports policy decisions, equitable practices and progress tracking. Assessment reports themselves should include relevant evidence on the effectiveness of food system governance and provide recommendations to help target governments' own capacity-building initiatives.

BOX 2. Examples of local 'evidence intermediaries'

The Centre for Rapid Evidence Synthesis at Makerere University in Uganda receives requests from policymakers and generates a rapid synthesis of relevant evidence. The centre's staff then seek to provide the evidence that policymakers need, tailored to their context, when they need it.

In São Paulo, Brazil, a Latin America-wide evidence hub called the Instituto Veredas has been established. This is a non-profit organisation focused on evidence-informed policymaking. It is designed to respond to what governments and decision-makers need.

FUNCTION 3: Ensure open access to data from across the food system

To empower decisions that are transparently grounded in rigorous analysis and to inform the policymaking process, it is imperative that people everywhere have access to comprehensive farm-to-fork data. Providing access to these data might take the form of one or more linked portals/dashboards, which must include a range of different forms and sources of data from countries, UN agencies and other data curators, including relevant private sector data. More and better information is needed on local and regional food sources, quality and prices; production processes (including input quantities and costs); environmental impact (such as on water quality, biodiversity and GHG emissions); market structures; diets and consumption patterns; drivers of food choices and consumer behaviour; local variability in food system drivers and outcomes; and social justice dimensions (e.g. food sector wages, working conditions and women's participation in activities along the food value chain).

If governments are to obtain a full understanding of how food systems are performing and the potential trade-offs of acting in one area but not in others, it is necessary to link data through machine learning and artificial intelligence. Collecting and curating

more real-time data by linking existing datasets and providing dashboards, as well as predictive modelling of food system risk, is essential. Today, there are dozens of interactive data platforms, integrative portals and visualisation dashboards that describe, monitor and track information related to food and nutrition. In addition, 'new' kinds of relevant information can be obtained from carefully monitored 'living laboratories' and sentinel sites, if these can be established and sustained as important knowledge factories through which impacts of national and subnational policy initiatives, climate change and environmental or price shocks can be better understood and documented.

However, a recent review concluded that no existing system 'cover[s] the full cycle from systematic data gathering and processing, proper analysis and interpretation of trends and patterns, delivery of results to inform policy developments and assessment, to confirm existing priorities and setting up new priorities for data collection' (Zhou et al., 2022, p. 9). In particular, data on low- and middle-income countries are often not available, and activities to improve data availability on a regular basis need to be supported. There are numerous technical and logistical challenges to overcome to ensure full and transparent access to rigorously collected food system data. For example, global standards would be required to ensure that data are interoperable. Systems must generate, collect and integrate different forms of knowledge that build on the principles of findability, accessibility, interoperability and reusability. Much can be learned from the principles established for the EU's Shared Environmental Information System (*Box 3*).

BOX 3. The Shared Environmental Information System

In 2008, the EU established principles for data sharing, including what information should be readily available to (a) public authorities to enable them to fulfil legal reporting obligations, and (b) end users and public authorities, allowing each to make comparisons at appropriate geographical scales. Information sharing and processing were to be supported through common, free open-source software tools. Today, the system involves several institutional bodies using online systems. A web-enabled technical infrastructure is supported by transparent governance arrangements to ensure coordination of technologies, data and human resources.

In addition, policies and governance mechanisms are necessary to balance the need for data to be made publicly available and the need to protect data for reasons related to privacy or intellectual property. Solutions to many of these challenging issues can be found by engaging with other sectors of society, such as the health sector or the financial sector, in which data must be held by individual institutions while some elements of the data are made accessible for broader inquiry. In this respect, the concept of 'federated databases' can be used in terms of ensuring that some aspects of data can be shared while other aspects are protected.



FUNCTION 4: Explore the future of food systems through modelling, forecasting and scenarios

An important benefit of modern analytical approaches is the ability to forecast trends to anticipate problems and predict a range of future developments. For instance, the entirety of the scientific and policy discourse around climate change is based on our ability to model the impact of GHG emissions on climate patterns. Any modelling approach has its limitations because it is a simplification of reality, and the implicit assumptions and biases of the modellers inevitably influence results. Therefore, while acknowledging the limitations of modelling, there is still a need for agencies and organisations to be empowered to use the best available knowledge and research to anticipate future trends and consider potential alternative pathways; these insights need to be made available transparently and must be accessible to relevant groups, who must represent different actors from multiple scales. A number of integrative assessment models have been developed, such as those used by the European Commission's Joint Research Centre (JRC), the International Food Policy Research Institute (IFPRI), the International Institute for Applied Systems Analysis, the Potsdam Institute for Climate Impact Research and the Global Trade Analysis Project working groups. Those models need to be maintained and further developed to provide 'holistic' food system assessments for regions and countries. Efforts should be undertaken to regularly organise both training and dissemination events around the world to inform policymakers of results and implications. In particular, information on low- and middle-income countries is less well covered than information on high-income countries in the models. This is also linked with the availability of data mentioned above.

Effective SPSIs must, therefore, catalyse the kinds of forward-looking efforts in foresight, modelling and scenario building that are needed to underpin multistakeholder dialogues on potential co-benefits and trade-offs, risks and opportunities, in addition to the costs and benefits associated with pursuing specific strategies. While forecasting and modelling are well known, foresight activities represent powerful policy tools that are not yet common in many lower-income settings or within existing regional and national interface mechanisms. Foresight provides intelligence (awareness of people's plans and thoughts about the future), sense-making (understanding of potential developments and their policy implications) and shared visions of challenges and opportunities, which help policymakers to structure the analysis of policy options and their implications, assess the drivers of change and analyse possible scenarios considering the values and interests at stake.

Overall, this suggests a need for a global network to coordinate different methods, which must include qualitative scenario development along with mathematical modelling. There is a need for coordinated, coherent and meaningful modelling, scenario building and foresight work at global, regional and local levels. Importantly, forecasting and scenario building must be much more focused than at present on policy and business options for enhancing food system resilience.

FUNCTION 5: Deliver independent assessment reports and policy pathway documents

Science can produce information that can be used to analyse food system problems, characterise current situations, anticipate the future outcome of trends, identify knowledge gaps, address trade-offs and seek to resolve policy-relevant controversies. Scientific endeavour can also generate evidence needed to avoid the worst outcomes and cost-effectively capture the widest net benefits. Policymakers, business leaders and civil society need to have a clear understanding of the kind of evidence they need, who to turn to for it and who to actively engage with to best shape evidence into policy-relevant digestible products.

While acknowledging that evidence is not the only ingredient required for generating change, most food system stakeholders share the view that the current evidence is not sufficient to meet today's grave challenges. Equally, the available evidence is typically not converted into actionable recommendations to support concrete policy initiatives. SPSIs should compile and distil robust evidence, be transparent on the degree of agreement or consensus on the quality of such evidence, and interpret the evidence in ways that support clearly articulated recommendations for action so that policymakers can make informed decisions on ways forward. For example, the periodic assessments and special reports by the Intergovernmental Panel on Climate Change (IPCC) have significant impacts on scientific and policy discussions, although they too could go further to (a) incorporate more elements of food systems linked to climate change and (b) focus more on potential actions to be taken to mitigate negative interactions.

Given the inherently localised nature of many food systems, assessment reports must include a greater emphasis on contextualisation to reflect local conditions (*Box 4*). Thus, the HLEG envisages regional- and national-focused reporting, alongside global reports, with a more forward-looking emphasis on future food demand and dietary patterns, income distribution, population concentrations and food sector interactions with other economic domains. Regional- and national-focused reports should use common standards to facilitate comparability. Such assessments should be rigorous, based on the best scientific data, translated into multiple languages and published according to a predictable schedule, whose cycles should be aligned with other major outputs.

BOX 4. Grounding global assessments in local realities

One existing mechanism that enhances interactions between marginalised groups and policymakers is the Global Hub on Indigenous Peoples' Food Systems platform, which serves as a bridge between scientific advancements and ancestral food traditions. The hub particularly focuses on the local knowledge and custodial practices that protect agrobiodiversity, often-neglected genetic resources and food system resilience.



On the other hand, different forms of evidence are needed to support dialogue, scenario building and policy initiatives. These include distilled lessons from the field, the costs and benefits of alternative courses of policy action, and the distribution of such costs and benefits. In other words, what might be defined as ‘policy pathway’ reports that draw on expert perspectives of many kinds (including local knowledge and concerns) are needed.

FUNCTION 6: Create a forum for diplomacy, standards and target setting, and policymaking

To translate the outputs from dialogues, capacity building, data dashboards, forecasting and assessment reports into policies that drive change, there must be diplomatic arenas to set standards and targets. This means that SPSIs must establish mechanisms whereby governments can engage in food diplomacy discussions, set policy goals and chart grand strategies. It is important to differentiate between aspirational goals, set on scientific grounds, and political or policy targets that emerge from a negotiation process that accounts for the complexity of social and economic systems, trade-offs among potentially conflicting targets and diverse stakeholder views.

There are various existing processes for stakeholder engagement around climate change, desertification and biodiversity. In the food domain, this function is supported by UN agencies and other global entities (such as the World Trade Organization and the UN Committee on World Food Security (CFS)), although the scope of discussions does not fully embrace the plurality of food-system-related issues and actors. Interactions between existing food system stakeholders are too limited, which leads to siloed topical and sectoral focus, membership, modalities of governance, and relationships with multilateral and other agencies offering secretariat support and funding. In short, the current landscape lacks global, regional and national coordination around common goals and principles. The latter are important conditions to ensure legitimacy and an efficient integration of evidence-informed actions at all scales across food systems.

Therefore, a key function of an effective SPSI landscape is ensuring that it produces knowledge that supports governments, policymakers, community leaders and industry in a coordinated effort to set targets and monitor progress (Figure 2). Such targets must link to outcome indicators (to measure whether results are achieved) and to specific policies and policy indicators (to measure whether sufficient efforts are invested with the aim of achieving the results). It is important that such a mechanism has the legitimacy to convene diplomatic dialogues. The UN has several such forums that organise dialogues. An analogous approach is the process used by the Conference of the Parties of the Convention on Biological Diversity following the signing of formal international treaties.

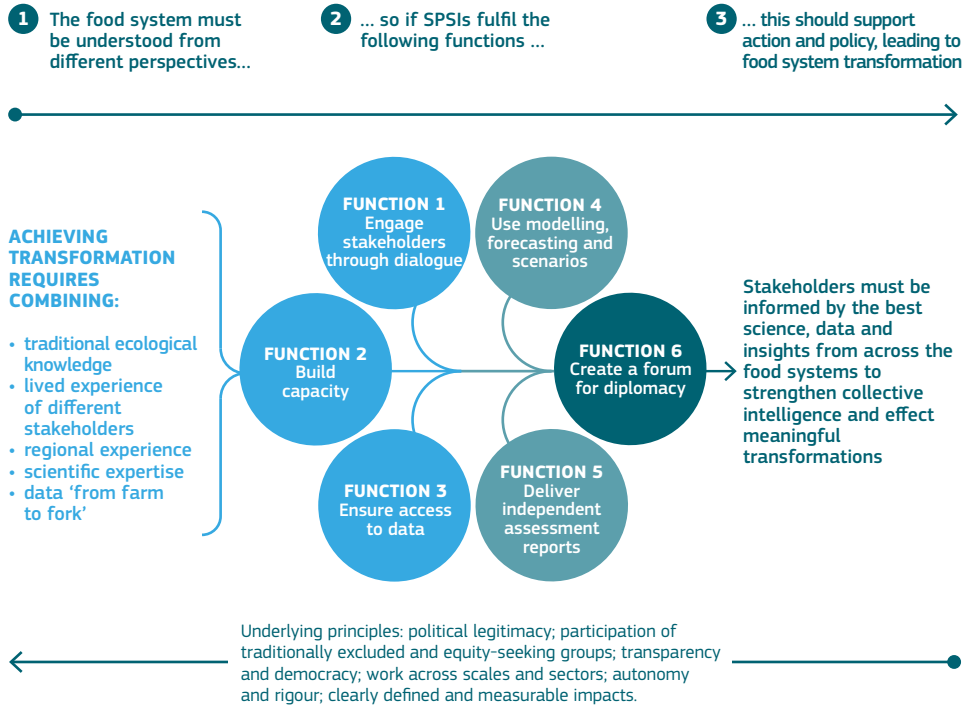


Figure 2. Theory of change linking multiple perspectives on food systems (step 1) to the proposed functions that SPSIs must perform (step 2) through to policy outcomes (step 3) Functions 1 to 3 (light blue) focus more on engagement and capacity; functions 4 and 5 (light green) are about analysis and assessment; and function 6 (dark green) is about delivering policy.

THE LANDSCAPE OF INTERFACES THAT LINK SCIENCE AND POLICY WITH SOCIETY

ASSETS WITHIN THE EXISTING LANDSCAPE

Today, numerous platforms, networks and institutions undertake work on many facets of food system transformation. These include the High-Level Panel of Experts (HLPE) on Food Security and Nutrition, which reports to the CFS and is designed to facilitate policy debates by providing advice at the request of the committee. An example of a global network approach is the InterAcademy Partnership, which involves over 140 national, regional and global academies working together in seeking evidence-based solutions for the world's most challenging development problems. This is based on the collective work of some 30 000 scientists, engineers and health professionals across approximately 100 countries. While some member academies were established by governments to support national policymaking, they are typically independent bodies from a scientific perspective.

Another example is the IPCC, which is widely recognised as one of the most influential global mechanisms for bringing researchers and governments together around the often-contentious policy-relevant science of climate change. The IPCC provides expert guidance on aspects of climate change that influence many dimensions of food systems. Similarly, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) reviews the science of biodiversity loss, thereby exploring food-system-related issues such as the importance of insect pollination for food production.

The UN Convention to Combat Desertification represents another form of intergovernmental mechanism that addresses drivers of land degradation. The UNFSS and the International Union of Concerned Scientists established multisectoral and multiscale platforms that promote global dialogue and engagement. Another example is the Association of International Research and Development Centers for Agriculture (AIRCA), which was responsible for launching a declaration on agricultural diversification and a subsequent global action plan for agricultural diversification during the 2015 UN Climate Change Conference (COP21) (*Box 5*).

BOX 5. Example of an interface mechanism that works across regions

AIRCA was founded in 2013 by seven centres working towards food and nutrition security. AIRCA, with offices in 33 countries and a team exceeding 2 000 people, conducts policy-focused research and provides advice to various governments in the countries it works in. Its research is published in international scientific journals and reports. AIRCA has created a searchable database (www.cabi.org/airca) of abstracts of key publications by member organisations, making them freely available.

Current mechanisms play different roles in generating or distilling scientific outputs, promoting better understanding of the current/future food system conditions, catalysing dialogue among stakeholders and setting priorities for national and global research. Each offers valuable contributions, such as reports, discussion forums, evidence prioritisation, scenario building and policy applications. Some of the current institutions support global scientific endeavours, some others catalyse regional dialogues across multiple constituency platforms and some others focus on harmonising intergovernmental strategies, policies and research. The examples provided here (see also Annexes 1 and 2) are a sample of existing SPIs considered during the HLEG's deliberations⁷.

The wide range of existing global, regional and national stakeholder mechanisms relevant to food systems represents an important array of assets on which future transformations can be built (*Box 6*). In particular, numerous research institutions, development agencies and one-off projects are instrumental at different scales and offer complementary inputs that must be harnessed in support of creating a more sustainable, equitable and nutritious food system. Despite these significant assets, there are gaps and weaknesses in terms of addressing evolving food system topics (such as local variability in food system drivers and outcomes, and social justice dimensions, including fair wages and safe working conditions). Similarly, there are challenges in linking or integrating multiple food system concerns/topics (e.g. the integration of global climate models with subnational food trade models and a better understanding of time constraints and convenience as drivers of household food choices) and gaps in how relevant stakeholders (public, private and civil society) engage in science-based policy dialogue. For example, many historically marginalised groups have a legitimate claim to active participation in discussions on food system transformation and to an equitable share of benefits; however, they lack the necessary resources and agency to engage in governance processes.

⁷ The examples used were examined in relation to the six functions identified as essential for effective interface mechanisms laid out in Chapter 1. Information on each institution or mechanism was collected from publicly available datasets and interviews with current or recent staff of those institutions or networking mechanisms, augmented by personal knowledge and insights of the HLEG members. Those selected should be seen as case studies illustrating the contributions of various mechanisms and platforms; the information generated should not be viewed as an exhaustive census.

BOX 6. National interests and concerns

In March 2022, the HLEG organised a regional focus group discussion with key representatives from the Arab region to discuss barriers, enablers and ways forward for food system stakeholder engagement. Annex 3 provides a summary of the discussion points. A major takeaway message is the need to ensure that national platforms are strengthened and equipped to work in a systemic way. How to package and communicate findings to decision-makers, the importance of creating capacity and the value of peer-to-peer learning among national mechanisms and platforms from regions with similar conditions were other key takeaways.



GAP ANALYSIS

Here, we present the results of a gap analysis of the current landscape in which we explore many of the largest global and regional mechanisms that touch on food systems and compare their current operations with the six functions described in Chapter 1. The results of the exercise are summarised in Annex 2.


- **ESSENTIAL FUNCTION 1: engage stakeholders through dialogue.** A secretariat or interlocutor is needed when engaging stakeholders at multiple scales and from across the farm-to-fork continuum. This secretariat or interlocutor must be mandated to work at local level across the globe, develop public-facing educational materials and create multiway conduits of engagement from the grassroots to the multilateral level. Formally, the FAO has country representatives all over the world. Nevertheless, the administrative burdens and funding constraints associated with many UN organisations hamper their ability to engage with a plurality and diversity of stakeholders. Empowering stakeholders requires more than dialogues, but the latter are a minimum requirement for a transparent process of engagement. Setting up accountability mechanisms that address concerns raised through such engagement is an important step.
- **ESSENTIAL FUNCTION 2: build capacity.** Syntheses of the most rigorous global evidence must be complemented by the generation of local evidence, and by analytical dialogues, to improve understanding of contextual factors that determine whether and how evidence will be used. A significantly enhanced global evidence and data ecosystem is part of the solution. Building and supporting an architecture of evidence generation and support systems across regions and within countries is just as important. There are many national and regional capacity needs for establishing a functional web of multidirectional linkages among science, policy and community needs.
- **ESSENTIAL FUNCTION 3: ensure open access to data from across the food system.** Enhanced coordination and sharing of evidence, local knowledge and policy-relevant data are needed to bridge datasets, fill gaps and deconstruct silos. There are existing important sources of both data and analytical outputs, but open access is not the norm, and they are

incompletely cross-referenced, lack interoperability, have inconsistent metrics, scales and time frames, and are more reliable and complete for some regions than for others. Indeed, there is a need to reassess what is commonly collated and disseminated as food-system-relevant data, since so much of the collection process was established and structured to address concerns of past decades, rather than those of the future. When it comes to creating an integrated data/evidence system that improves access to comprehensive farm-to-fork data for all stakeholders, there needs to be one or more publicly accessible portals that disaggregate data and also include private sector data, in addition to information on environmental impacts, land uses, diets and nutrition, all at multiple scales. This is a major gap that any future landscape of SPSIs must address and resource.

- **ESSENTIAL FUNCTION 4: explore the future of food systems through modelling, forecasting and scenarios.** The fourth function of SPSIs, closely connected to function 3, is producing models, forecasts and scenarios that explore potential future food system alternatives and transformation pathways at all scales (from global to subnational as appropriate). This functionality is limited in the current landscape of SPSIs. Organisations such as the FAO have some ability to forecast or develop 'over the horizon' reports. Similarly, the EU Standing Committee on Agricultural Research (SCAR) produced five foresight reports between 2013 and 2021. However, at present, there are few organisations engaged in systematic long-term planning or forecasting for the entirety of food systems at relevant scales. To address this gap, the future landscape of SPSIs needs to engage with (and catalyse) networking and data sharing among researchers who have the capacity to build, test, validate and run disaggregated models or to host forecasting or scenario-building exercises. Such activities should embrace both quantitative forecasting tools and qualitative scenario-building exercises, and they must be carefully rooted in local and regional realities. This would not be based on establishing new institutions; rather, the goal should be to better connect the many ongoing activities that offer disparate pieces of an overall picture relevant to food system transformation.
- **ESSENTIAL FUNCTION 5: deliver independent assessment reports and policy recommendations.** One function that the IPCC has delivered for climate change is to produce rigorous, independent and high-quality assessment reports that provide updates on targets, progress and trends. In terms of equivalents for food systems, the closest examples today are the annual State of food security and nutrition in the world report, published by the FAO and partners, and the periodic reports published by the HLPE on Food Security and Nutrition. These impressive outputs move in the direction set out in the IPCC's assessments. Ideally, a regular calendar of food system assessments, with global assessments being published approximately every 5 years, is needed. These global assessment reports should be complemented by region- and topic-specific special reports. Region-specific interfaces between policymakers and researchers can play very important roles through building the capacity of national governments, harmonisation of metrics, peer learning and support for collective action on cross-border issues (*Box 7*).

Box 7. European examples of scientific engagement with policy agendas

In Europe, a region-wide SAM provides guidance to the European Commission on a variety of topics. The SAM is composed of a group of chief scientific advisors, a consortium of European academies (SAPEA) and a secretariat hosted by the European Commission. This collective delivers independent scientific advice to the European Commission to inform policymaking and improve interactions between policymaking and scientific advice. The European Commission can consult the group at any time on any policy topic, specifying the time span in which advice is needed. The advice provided is based on the most important and relevant evidence and empirical findings that can support decision-making, including an assessment of the robustness and limitations of the evidence and empirical findings.

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ESSENTIAL FUNCTION 6: create a forum for diplomacy, standards and target setting, and policymaking. A primary requirement for SPSIs is to provide forums for diplomacy around setting targets, metrics for assessing progress and validation of evidence used to support food policy actions. At a minimum, this means there must be a mechanism that has the legitimacy to engage policymakers to build consensus around priorities and to define aspirational goals that can become concrete targets through political negotiation. Negotiated positions on evidence and policy goals represent a form of ‘science diplomacy’ based on dialogues that shape perceptions of evidence needs and improve understanding of how the demand for policy-relevant science can be enhanced. Today, the CFS, hosted by the FAO, promotes science diplomacy on a range of topics. Its debates are supported by inputs from a wide range of food system stakeholders, including governments. However, there remains a need to promote a more coherent food-system-wide lens in its dialogues and greater flexibility and agility in responding to rapidly changing events. A second organisation that has some capacity to contribute to national and cross-country dialogue is One CGIAR (formerly the Consultative Group for International Agricultural Research). However, it is not currently resourced to convene regular/frequent national-level dialogues.

Annexes 1 and 2 present a summary of the gap analysis from which the HLEG drew the conclusion that the current landscape of SPIs is lacking. The institutions, platforms and/or forums considered are strong in some of their functions but weaker in others. Furthermore, the fragmented nature of expertise and access to knowledge is one factor that undermines the governance of food systems. Transformation will not happen unless it is brought about by deliberate engagement among stakeholders across food systems – not just governments, but also industry, farmers, consumers and everyone in between. Indeed, the biggest danger of doing nothing, or too little, is further fragmentation of initiatives that drive policies and investments in divergent ways, resulting in net effects that cancel out or negate positive actions.

PATHWAYS FOR TRANSFORMATIVE CHANGE

Current science–policy interfaces offer valuable resources and space for discussions. However, mainstreaming systems perspectives into policy actions remains a challenge, as does ensuring the complementary and functional contribution of a wide range of relevant institutions and platforms to address current and future challenges. Science generally remains bound by separate disciplines, while policy frameworks are addressed through sector-specific funding and actions. Governance is too often constrained by different scales that do not intersect and by groups of stakeholders that were established to fulfil institutional and sectoral responsibilities of the past. The effect of such constraints is the exclusion of integrated analyses, many voices and potential actions. The food system is embedded in the wider bioeconomy and the wider financial resource economy, and this raises the need to engage with stakeholders whose focus is outside the food system. Importantly, transformation is not a one-off event. It requires an in-built capacity to respond and adapt over time. This inherently entails flexibility and avoiding future path dependency through regular renewal of processes and structures.

We propose three potential pathways, each of which could be independent but would have far greater impact if implemented as a cascading series of interlinked and mutually supporting goals. The first pathway involves adapting the current landscape to include additional resources and broader mandates to engage across sectors and scales. Ideally, existing structures should be adapted to help support more radical reforms in legitimate political and institutional contexts and make some progress towards addressing some of the systemic issues outlined in this report. The second pathway, which builds on the first, involves enhancing the current landscape of information-sharing and engagement mechanisms, including the convening of task forces to address a range of priority knowledge or activity gaps. The third pathway is to pursue the aspiration of an international coordination hub that catalyses and brings together a global network of SPSI networks. The process of adapting, enhancing and creating within the landscape of current mechanisms should be ongoing and iterative. In short, the HLEG proposes a set of actions that would improve the ability of the ecosystem of SPSIs to address real and pressing needs everywhere and at all scales.

PATHWAY 1: Adapt the current landscape to include additional resources and broader mandates

A first step would be to increase and sustain the funding and mandates of existing organisations to develop integrated and coherent joint actions. Additional (new)

resources and mandates could be delegated to one or more existing entities (such as the HLPE on Food Security and Nutrition, the IPCC, the IPBES and/or One CGIAR) to act as a convening group tasked with working beyond its traditional horizons and with stakeholders not usually involved (especially national and regional organisations). Working jointly in a 'safe space', this set of SPSIs could focus on generating a series of rigorous assessments on topics that cut across usual (sectorally focused) SPSI outputs, on a prearranged schedule. Importantly, whichever organisation(s) takes on this task must develop a process that is independent, rigorous and transparent. This process must avoid being influenced by any political agenda. Such an endeavour would need to explicitly and deliberately build on, and enhance, annual reporting already carried out around the globe. In addition, all existing entities, including international standard-setting bodies, should be encouraged to incorporate food system sustainability dimensions into their work where such issues are relevant to their activities. For example, the Regional Universities Forum for Capacity Building in Agriculture, which is a consortium of 147 African universities across 38 countries, already seeks to strengthen the capacity of locally based researchers in the context of national development. However, the forum is resource constrained and heavily focused on agricultural research. With greater resources, improved technical capacity to expand training and a wider remit that would link to food-systems-wide issues, such a regional network could achieve much more.

A second aspect of this first pathway could be to encourage and support organisations such as the EU Farm Sustainability Data Network and the FAO Corporate Statistical Database (FAOSTAT) to enhance the post-UNFSS hub, link more coherently with other relevant databases/dashboards and become more of a central data hub for a range of databases currently hosted by other large multilateral organisations (such as the World Bank, the UN Environment Programme (UNEP), the World Food Programme, the Organisation for Economic Co-operation and Development and the IPCC). Establishing this sort of common data portal would require building on existing data governance mechanisms, such as the Global Open Data for Agriculture and Nutrition, and would also require defining (a) what is where and held by whom (across the food system), (b) the interoperability of various kinds of data and datasets, (c) where the gaps (in data, outputs of analyses, scales covered, etc.) are and (d) what funding and mandating are necessary to upgrade what currently exists and by when.

A third dimension would be to transform the disciplinary/sectoral focus of existing mechanisms used for scientist–policy exchanges, such as conferences, the provision of technical advice, policy-focused papers and political processes. Decision-makers must be encouraged to pursue intersectionality and transdisciplinarity. Enhanced peer-to-peer processes are needed to generate demand for different kinds of evidence and engagement approaches, drawing on expert perspectives of many kinds (including local knowledge and concerns).

PATHWAY 2: Enhance the current landscape with multisectoral task forces

A second, and more ambitious, pathway is the facilitation of a series of multisectoral task forces to deliver each of the core functions identified in Chapter 1. The UNFSS Scientific Group called for new forms of relationships among independent scientists, private sector researchers and civil society stakeholders using specialised country-level engagement, bottom-up evidence sharing, fuller engagement of knowledge communities across all geographical regions and flexibility of funding and work streams to be responsive to changing circumstances (von Braun, 2021). Task forces that engage stakeholders at all scales can be convened by a central secretariat. For example, a task force might be formed to convene a global network of food system dialogues and link the outputs of these dialogues with regional and national policymaking. Such a task force would build on the food system dialogues that were part of the UNFSS process but be empowered to extend the reach of these dialogues, connecting them to policymakers. Another task force could tackle the need for better data aggregation and governance.

The formulation of task forces would have to be underpinned by a blueprint for a longer-term political process that would need to tackle tough questions such as who would lead this process, whom it would respond to and where it would be embedded. Task forces would also have to commit to considerable capacity building as a key strategy to reduce systemic barriers to participation by equity-seeking and historically marginalised groups. Long-term capacity building can be achieved by supporting an expansion of existing networks. One example is the International Network for the MBA Agribusiness and Commerce, which grew out of the EU-funded Tempus project and now supports regional capacity building on business administration in agriculture in eastern Europe and central Asia. This network represents a regional grassroots movement of higher education institutions. The programme covers parts but not all of the food system, and it is embedded in bioeconomy education by being part of the European Bioeconomy University.

Task forces could be structured as a matrix, which would cover various topics and regions and would not necessarily have to be completely dependent on the priorities of specific regions or topics. At the same time, the different task forces should be open to all stakeholders, depending on the region and topic. This would result in a multilevel governance system that allows needs to be addressed at different scales and meso-level initiatives to receive targeted support (Welch et al., 2021).

PATHWAY 3: Coordinate agendas by creating a 'network of networks'

Much like pathway 2 builds on pathway 1, pathway 3 picks up on pathway 2's activities as a nested series of actions and deliverables. More specifically, the central goal of pathway 3 is to task one or more existing organisations with forming an international coordination hub to convene a network of SPSIs operating at relevant scales. The proposed SPSI hub would complement the new coordinating hub established after the UNFSS. The latter aligns itself with existing UN functions and capacities, and aims to catalyse actions inside the UN system

in relation to food systems and the 2030 agenda. The SPSI coordinating hub would go far beyond those aims, taking on a forward-looking science-driven agenda that would apply the principles and diverse functions of SPSIs laid out in the current report. This 'network of networks' should play an important role in generating the information needed for policymaking. It can roll out initiatives for harmonised generation of data, similar to the EU Farm Sustainability Data Network. Furthermore, this network of networks would be an important intermediary between micro- and macro-level initiatives, ensuring information exchange between those levels. Examples include regional-level initiatives such as the Economic Research Service of the United States Department of Agriculture, the Thünen Institute in Germany, the European Environmental Agency (EEA), the European Commission's JRC and the Chinese Academy of Agriculture Sciences, which together illustrate what can be achieved with sustained funding.

A core function of this network of networks would be to connect the dots – that is, to systematically increase collaboration among existing networks/platforms/panels in ways that enhance representation of stakeholders and cover all important food system dimensions. For example, linking the many existing SPSIs, expert panels and dashboard activities working on relevant issues would allow for integration that goes beyond preparing 'reports of reports'. New mechanisms and spaces for engagement are also needed if different sectors and disciplines are to productively interact. For example, horizontal networks undertaking similar activities could interact three times a year to discuss thinking and policy initiatives from regions/countries. They would identify controversies, challenges and trade-offs, and bring alignment, when possible, to promote global policy coherence, leading to net positive outcomes across all food systems. These networks could, for example, link up functions of SCAR, SAM, the EEA, the European Food Safety Authority (EFSA), the JRC and the Science Advice for Policy by European Academies (SAPEA) consortium from the EU side with other relevant national and regional entities, such as the Forum for the Americas on Agricultural Research and Technology Development (FORAGRO), the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) and the Chinese Institute of Policy and Strategy for Agriculture and Rural Development.

At a minimum, building greater collaboration within the existing landscape requires active political engagement with governments and food corporations that have yet to commit to collecting and disseminating metrics and indicators in different locations and at different scales. This means that clusters of national governments would need to collaborate on regional processes and that the food system transformation agenda would be better integrated with existing SDG commitments. From the insights gained from a focus group in the Arab region (see Annex 3), it may be pertinent to look at the benefit of building capacity within political institutions in terms of the value of a systemic, evidence-based approach that ensures multisectoral involvement of all actors and elements working towards a joint goal.

Another function would be to identify capability constraints among local and regional partners and catalyse institutional capacity building. Countries are at different stages on the way to transforming food systems and have very different resource, information

and capacity constraints. A goal would be to build the multidirectional linkages among the needs of science, policy and society, including human resource development and institutional and legal framework development, to enhance knowledge and skills but also agency at national and subnational levels. Every country has a national infrastructure that incorporates various evidence-generating structures and processes. But even when such structures and processes are strong, national and subnational uptake and the implementation of evidence often need to be strengthened. Capacity-building exercises need to be deliberately grounded in the core principles of equity, transparency, legitimacy and rigour (as described in Chapter 1). Furthermore, it needs to be acknowledged that there are many forms of evidence ‘intermediaries’ (organisations or individuals) that work ‘in between’ evidence producers, decision-makers and societal stakeholders (Gurinovic et al., 2020). These intermediaries often support decision-makers with data and information, translating scientific findings into insights and opportunities for achieving change.

A third potential role for a network of networks could be to administer funding on behalf of the entire network to resource particular tasks related to the functions required by SPSIs. This might include allocating funding for regional assessment reports and convening multisectoral and multistakeholder scenario dialogues and foresight work for targeted regions or scales. Indeed, SPSIs could be empowered to conduct modelling-based assessments for specific countries and regions with explicit consideration of local concerns, solutions and innovations.

Fostering collaboration (including publishing collaborative outputs) would require an appropriate allocation of resources to support the collection and collation of more comprehensive food system data, information and knowledge. Financially, adapting the work and resources of existing institutions and other mechanisms for cooperation and networking would not necessarily entail expanding budgets or the creation of new institutions. However, to be effective, increasing partnerships across networks would require overarching coordination, the facilitation of data sharing and ensuring multilingual and multidisciplinary perspectives.



REVISING FOOD SYSTEM INTERFACES – RECOMMENDATIONS AND CONCLUSIONS

The COVID-19 pandemic and the Ukraine crisis both exposed major weaknesses of the global food system relating to food availability and accessibility; food prices and affordability; food acquisition practices; and food preparation and consumption. All of this reinforces the need to build food environments that are more resilient to future shocks and stresses while being sustainable (Molina-Montes et al., 2021; O’Meara et al., 2021; von Braun, 2021; Webb et al., 2021). However, the food systems that exist today are neither eternal nor accidental. They are shaped by investment decisions, economic incentives, societal goals, patterns of consumer demand and business and governmental actions. Past decisions can be changed, and new choices can be made. But every choice should be a well-informed and deliberate action. When appropriate evidence is not available to governments, business leaders or citizens (or is available but not systematically used), poor decisions are inevitable, and the status quo becomes ever more entrenched. In some cases, there is opposition to recommendations based on science because of diverging views or vested interests. The resulting waste of resources and the damage caused to both human and planetary health represent a failure of governance on a grand scale. A recent editorial in the journal *Nature* argued that ‘each country needs a mechanism for supplying evidence that is appropriate to its systems of governance and wider needs’ (*Nature*, 2022, p. 7). Furthermore, such evidence must be distilled through such mechanisms in ways that make uptake both more likely and more effective.

The international political economy within which the transformation of food systems must occur has been shaped by commitments made at the four international meetings held during 2021: the UNFSS, the UN Biodiversity Conference (COP15, Part 1), the 2021 UN Climate Change Conference (COP26) under the UN Framework Convention on Climate Change; and the Nutrition for Growth Summit. In summoning the UNFSS, the UN Secretary-General noted that sustainable food systems are key to achieving the SDGs (UN Secretary-General, 2021). The combination of the commitments made at those meetings, the lessons learned from the pandemic and insights from the Ukraine crisis combine to underscore the urgency of food system transformation, to cope with the crisis but also to address long-term sustainability challenges.

Food system transformation will, of course, require an institutional environment that is supportive of the changes needed. In other words, novel approaches are required to ensure that all food system stakeholders are well served by at least six key functions of interface systems. In particular, such novel approaches must meet new kinds of demands for evidence, knowledge and insight; address much greater complexity and intersystem dynamics (including resistance and obstacles to change; controversies, trade-offs and synergies among sectors and temporal and spatial scales; distributional effects; enforcement of the right regulation; path dependency; and cost and risk of change); serve the functions demanded of many different stakeholders; effectively support policy-level decisions needed to take transformative actions; and catalyse global and regional approaches that support local food systems.

All relevant evidence should be presented in tangible ways to provide countries with detailed, operational action guidance and interpretable recommendations. In addition, data must be presented in ways that steer countries to make sound decisions towards transformation and that highlight transparent trade-offs in making decisions across complex systems. The recent Global Commission on Evidence to Address Societal Challenges report Evidence to Address Societal Challenges called on governments everywhere to 'help to build a better evidence-support system in their country' (Global Commission on Evidence to Address Societal Challenges, 2022, p. 107). This represents a long-term goal and will require a degree of flexibility and adaptability that is challenging to achieve. There is no single solution; rather, **this report describes a set of actions that should allow what exists to be adapted to achieve gains, possibly catalysed through initiatives that add value** by introducing new capacities, activities, responsibilities or resources. This entails three important overarching ambitions.

- Multilateral governance organisations, such as the European Commission and the UN, and national governments must **fully adopt a food system** lens in all investments and activities. This lens should link producers through to processors and consumers by empowering all relevant stakeholders, diverse voices and geographical regions to make food system transformation a reality.
- In adopting a food system lens, governance organisations, including national governments and regional bodies, should work collectively to **connect stakeholders across multiple scales** (from global to local). Efforts underpinning global integration should convene regular multistakeholder dialogues, anticipate trends, set targets, establish policies and debate progress to fuel action at different scales, ensuring overall consistency of policy actions and address trade-offs. The global community must improve how the differences between science and knowledge are articulated and treated so that effective

SPSIs can be designed and used and have impact. This includes analysing gaps in both scientific evidence and knowledge and prioritising actions to close those gaps. Importantly, such an approach must help connect the many different SPIs that support diverse policy agendas, different disciplinary agendas and divergent development goals. The ecosystem of current evidence-building activities and evidence-based actions must achieve policy coherence and secure meaningful measurable impacts.

- As a global community, we must work to **strengthen the current landscape of SPSIs to engage a wider range of voices, integrate data, anticipate trends, and set targets and standards, to build a desired future**. Links between evidence and knowledge and concrete policy or commercial action must be more clearly delineated. Science and knowledge in addition to public and private sector investments can all be (and sometimes are) instrumentalised for the sake of vested interests. The risks of this must be made transparent and safeguards must be managed. In addition, the fragmented nature and ‘location’ of expertise must be better articulated and addressed. This entails identifying who has voice and legitimacy, where this person exists in terms of food system governance and the scale at which they operate.

The three pathways comprise the strategic focuses recommended by the HLEG. These are not mutually exclusive but represent three nested approaches that could be worked towards through an iterative process (Figure 3). Building on this, the HLEG recommends a set of nine priority actions aiming to achieve the broad ambitions and securing progress along the three pathways outlined above. While the sets of recommendations could be implemented sequentially, the HLEG believes that coherent and simultaneous implementation of the recommendations will achieve faster impacts and greater effects. The recommendations organised under the umbrella of the three pathways are as follows.

RECOMMENDED PATHWAY 1: adapt the current landscape to include additional resources and broader mandates

Multilateral governance (e.g. cooperation between the European Commission and the UN) should strengthen and adapt existing SPIs using additional resources and under a broader mandate for engagement across sectors and across scales.

- **Specific recommendation 1.** Additional (new) resources and expanded mandates could be given to one or more existing entities (such as the Committee on World Food Security, the Intergovernmental Panel on Climate Change, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services and/or One CGIAR) to act as a convening group tasked with working beyond traditional horizons and stakeholders.

- **Specific recommendation 2.** Working as a team, leading global organisations (the European Commission, the UN, etc.) should promote greater integration of existing SPSIs to generate rigorous assessments on topics that cut across conventionally siloed outputs.
- **Specific recommendation 3.** Support FAOSTAT and other data portals, such as the EU Farm Sustainability Data Network, to improve harmonisation and interoperability of data, set higher agreed data standards and quality control, and establish global and regional data hubs with a range of databases currently hosted by other large multilateral organisations (potentially including the World Bank, the UN Environment Programme, the World Food Programme, the Organisation for Economic Co-operation and Development, and the International Fund for Agricultural Development, etc.). Simultaneously, support capacity building in regions with limited or no such databases to establish and maintain databases and link them to international portals.

RECOMMENDED PATHWAY 2: enhance the current landscape with multisectoral task forces

Multilateral institutions, including the European Commission and the UN, should cooperate with bilateral donors and national governments to fund a series of dedicated task forces to fill priority knowledge and data gaps.

- **Specific recommendation 4.** Convene a task force to continue the work carried out in the lead-up to the UNFSS by facilitating a global series of ongoing food system dialogues, and link the outputs of these dialogues with regional and national policymaking.
- **Specific recommendation 5.** Convene a task force of people involved in existing SPSIs to create a blueprint for a longer-term political process that would tackle questions such as who would coordinate SPSIs and how such an institutional structure could be embedded in legitimate political structures..
- **Specific recommendation 6.** Convene a task force to develop regionally specific and publicly accessible capacity-building modules (on topics such as healthy diets and improved nutrition), and integrate these modules into extension services.

RECOMMENDED PATHWAY 3: coordinate agendas by creating a 'network of networks'

The European Commission, the UN, UN agencies and other multilateral institutions should collectively invest in a new forward-looking network coordination hub that builds capacity, convenes regional assessments and undertakes foresight exercises, forecasts and models trends based on forward-looking science.

- **Specific recommendation 7.** Fund a global coordination hub to identify capability constraints and needs among local and regional partners, and build institutional capacity to strengthen the multidirectional linkages between the needs of science, of policy and of society.
- **Specific recommendation 8.** Administer funding on behalf of the entire network to support tasks related to the functions required by SPSI, including the production of regional assessment reports and convening multisectoral and multistakeholder scenario dialogues globally or in targeted locations.
- **Specific recommendation 9.** Empower and fund national and regional research bodies to conduct quantitative and qualitative modelling-based assessments and foresight exercises for specific countries and regions, with explicit consideration of local concerns, solutions and innovations.

A vision for a better future must link the various needs of scientists, governments and other stakeholders at all scales. What we have today is a good start, but it is not enough to meet new demands for insights on issues of great complexity and to support policy decisions more effectively. An SPSI for food systems must support a transformation that acknowledges the embeddedness of food systems in the wider bioeconomy and sociocultural norms. Planetary boundaries must be considered in addition to the institutional environment that food systems are rooted in. Adoption of the pathways for transformation of food systems recommended here requires national government buy-in, realistic levels of funding, and championing by both the scientific and the development community.

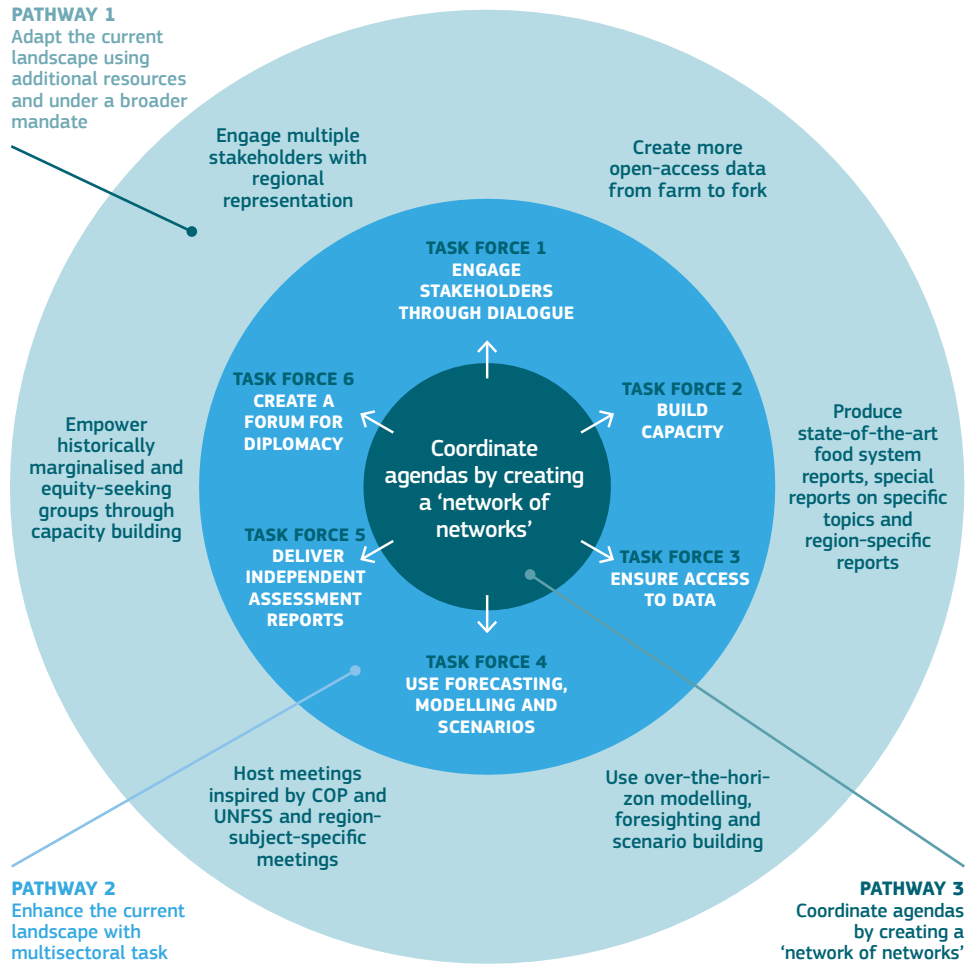


Figure 3. The three pathways illustrated as a series of nested approaches.
NB: COP, Conference of the Parties of the Convention on Biological Diversity.

BIBLIOGRAPHY

2021 *Global Nutrition Report: The state of global nutrition*, Development Initiatives, Bristol (www.globalnutritionreport.org).

Achterbosch, T. J., Getz Escudero, A., Dengerink, J. D. and van Berkum, S. (2019), *Synthesis of existing food systems studies and research projects in Europe*, Publications Office of the European Union, Luxembourg (<https://data.europa.eu/doi/10.2777/004919>).

Béné, C. (2022), 'Why the great food transformation may not happen – a deep-dive into our food systems' political economy, controversies and politics of evidence', *World Development*, Vol. 154, No 105881 (<https://doi.org/10.1016/j.worlddev.2022.105881>).

Biermayr-Jenzano, P. (2020), *Obesidad y Género: Enfoque de Género y Salud Alimentaria Nutricional en América Latina*, IFPRI LAC Working Paper No 8 (<https://doi.org/10.2499/p15738coll2.134021>).

Caron, P., Ferrero y de Loma-Osorio, G., Nabarro, D., Hainzelin, E., Guillou, M., Andersen, I., et al. (2018), 'Food systems for sustainable development: Proposals for a profound four-part transformation', *Agronomy for Sustainable Development*, Vol. 38, No 4 (<http://www.doi.org/10.1007/s13593-018-0519-1>).

Diaz-Bonilla, E., Paz, F. and Biermayr-Jenzano, P. (2020), *Nutrition Policies and Interventions for Overweight and Obesity: A review of conceptual frameworks and classifications*, IFPRI LAC Working Paper No 6 (<https://doi.org/10.2499/p15738coll2.133584>).

European Commission (2017), *The common agricultural policy and the next EU budget – Reflection paper No. 2: Preparing for the multiannual financial framework after 2020*, Bertelsmann Stiftung, Brussels (https://www.bertelsmann-stiftung.de/fileadmin/files/user_upload/EZ_Reflection_Paper_2_Taubadel_2017_ENG.pdf).

European Commission (2019), *Towards a Sustainable Europe by 2030 – Reflection paper*, COM(2019) 22 final (https://ec.europa.eu/info/sites/default/files/rp_sustainable_europe_30-01_en_web.pdf).

European Commission (2020), *Food 2030 Pathways for Action: Research and innovation policy as a driver for sustainable, healthy and inclusive food systems*, European Commission Directorate-General for Research and Innovation, Brussels (<https://op.europa.eu/en/publication-detail/-/publication/86e31158-2563-11eb-9d7e-01aa75ed71a1>).

European Commission (2022), Commission communication – Safeguarding food security and reinforcing the resilience of food systems, COM(2022) 133 final (https://ec.europa.eu/info/sites/default/files/food-farming-fisheries/key_policies/documents/safeguarding-food-security-reinforcing-resilience-food-systems.pdf).

Fanzo, J., Haddad, L., Schneider, K. L., Béné, C., Covic, N. M., Guarin, A., et al. (2021), 'Viewpoint: rigorous monitoring is necessary to guide food system transformation in the countdown to the 2030 global goals', *Food Policy*, Vol. 104, No 102163 (<https://doi.org/10.1016/j.foodpol.2021.102163>).

FAO (2021), *Europe and Central Asia – Regional overview of food security and nutrition 2021: Statistics and trends*, FAO, Budapest (<https://doi.org/10.4060/cb7493en>).

FAO, IFAD, UNICEF, WFP and WHO (2020), *The state of food security and nutrition in the world 2020 – Transforming food systems for affordable healthy diets*, FAO, Rome (<https://doi.org/10.4060/ca9692en>).

FAO, IFAD, UNICEF, WFP and WHO (2021), *The state of food security and nutrition in the world 2021: Transforming food systems for food security, improved nutrition and affordable healthy diets for all*, FAO, Rome (<https://doi.org/10.4060/cb4474en>).

FAO, WFP, UNECE, UNICEF, WHO and WMO (2021), *Regional overview of food security and nutrition in Europe and central Asia 2020*, FAO, WFP, UN, UNICEF, WHO and WMO, Rome (<http://www.fao.org/documents/card/en/c/cb3849en>).

Global Commission on Evidence to Address Societal Challenges (2022), *The Evidence Commission Report: A wake-up call and path forward for decision-makers, evidence intermediaries, and impact-oriented evidence producers*, McMaster Health Forum, Hamilton, Canada (<https://www.mcmasterforum.org/networks/evidence-commission/report/english>).

Gurinovic, M., Milosevic, J., Zekovic, M., Kadvan, A., Ranic, M. and Glibetic, M. (2020), 'Capacity development in food and nutrition in central and eastern Europe: a decade of achievements', *Food Policy*, Vol. 96, No 101850 (<https://doi.org/10.1016/j.foodpol.2020.101850>).

Hainzelin, E., Caron, P., Place, F., Alpha, A., Dury, S., Echeverria, R. and Harding, A. (2021), 'How can science-policy interfaces boost food systems transformation?', *Food Systems Summit Brief for the Scientific Group for the Food Systems Summit*, 14 May 2021 (https://sc-fss2021.org/wp-content/uploads/2021/06/FSS_Brief_Science_Policy_Interactions.pdf).

HLPE on Food Security and Nutrition (2014), *Food losses and waste in the context of sustainable food systems*, HLPE on Food Security and Nutrition, Rome (<https://www.fao.org/3/i3901e/i3901e.pdf>).

HLPE on Food Security and Nutrition (2017), *Nutrition and Food Systems*, HLPE on Food Security and Nutrition, Rome (<https://www.fao.org/3/i7846e/i7846e.pdf>).

HLPE on Food Security and Nutrition (2020), *Food Security and Nutrition: Building a global narrative towards 2030*, HLPE on Food Security and Nutrition, Rome (<https://www.fao.org/3/ca9731en/ca9731en.pdf>).

HLPE on Food Security and Nutrition (2022), *The impacts on global food security and nutrition of the military conflict in Ukraine – Briefing note for the Committee on World Food Security*, HLPE on Food Security and Nutrition, Rome (https://www.fao.org/fileadmin/templates/cfs/Docs2122/Bur/220429/Impacts_of_the_military_conflict_in_Ukraine_on_global_FSN_HLPE_briefing_note_2022-04-14.pdf).

InterAcademy Partnership (2019), *Harnessing science, engineering and medicine (SEM) to address Africa's challenges: The role of African national academies*, InterAcademy Partnership (https://www.interacademies.org/sites/default/files/publication/final_africareportdigital.pdf).

International Panel of Experts on Sustainable Food Systems (2019), *Towards a common food policy for the European Union*, International Panel of Experts on Sustainable Food Systems, Brussels (https://www.ipes-food.org/_img/upload/files/CFP_FullReport.pdf).

Molina-Montes, E., Uzhova, I., Verardo, V., Artacho, R., García-Villanova, B., Guerra-Hernández, E. J., et al. (2021), 'Impact of COVID-19 confinement on eating behaviours across 16 European countries: the COVIDiet cross-national study', *Food Quality and Preference*, Vol. 93, No 104231 (<https://www.sciencedirect.com/science/article/pii/S0950329321000586>).

Nature (2022), 'Editorial: wanted: better systems for turning evidence into action', *Nature*, 2022, Vol. 603, pp. 7–8 (<https://www.nature.com/articles/d41586-022-00559-9>).

Nowotny, H. (2003), 'Democratising expertise and socially robust knowledge', *Science and Public Policy*, Vol. 30, No 3, pp. 151–156 (<https://doi.org/10.3152/147154303781780461>).

O'Meara, L., Turner, C., Coitinho, D. C. and Oenema, S. (2021), 'Consumer experiences of food environments during the Covid-19 pandemic: global insights from a rapid online survey of individuals from 119 countries', *Global Food Security*, Vol. 32, No 100594 (<https://doi.org/10.1016/j.gfs.2021.100594>).

Ruiz, M. and Vermooy, R. (2012), *The custodians of biodiversity sharing access and benefits to genetic resources*, International Development Research Centre/Earthscan, Ottawa (<https://www.tandfonline.com/doi/abs/10.1080/14486563.2012.757203?journalCode=tjem20>).

SAPEA (2020), *A Sustainable Food System for the European Union*, Evidence Review Report No 7, SAPEA, Berlin (<http://www.doi.org/10.26356/sustainablefood>).

UN Secretary-General (2021), *Secretary-General's chair summary and statement of action on the UN Food Systems Summit – Inclusive and transformative food systems nourish progress to achieve zero hunger*, 23 September 2021 (<https://www.un.org/en/food-systems-summit/news/making-food-systems-work-people-planet-and-prosperity>).

van den Hove, S. (2007), 'A rationale for science–policy interfaces', *Futures*, Vol. 39, No 7, pp. 807–826 (<https://doi.org/10.1016/j.futures.2006.12.004>).

von Braun, J. (2021), *Engaging science for national and international level implementation of the action agenda of the United Nations Food Systems Summit* (<https://www.fss2021.org/wp>).

von Braun, J., Afsana, K., Fresco, L. and Hassan, M. (2021), 'Food systems: seven priorities to end hunger and protect the planet', *Nature*, Vol. 597, pp. 28–30 (<https://www.nature.com/articles/d41586-021-02331-x>).

Welch, E., Louafi, S., Carroll, S. R., Hudson, M., Ijsselmuiden, C., Kane, N., et al. (2021), *Post COVID-19 implications on genetic diversity and genomics research & innovation: A call for governance and research capacity* (<http://www.fao.org/3/cb5573en/cb5573en.pdf>).

Zhou, B., Liang, S., Monahan, K. M., Singh, G. M., Simpson, R. B., Reedy, J., et al. (2022), 'Food and nutrition systems dashboards: A systematic review', *Advances in Nutrition*, nmac022 (<https://doi.org/10.1093/advances/nmac022>).

2. CANADIAN FOOD POLICY ADVISORY COUNCIL

Formed in 2021 as part of the Canadian national food policy, the Canadian Food Policy Advisory Council (CFPAC) is a multistakeholder volunteer group of around 20 individuals mandated to provide advice to the federal cabinet (through the Minister of Agriculture and Agri-Food). A secretariat is also housed within Agriculture and Agri-Food Canada. The council is currently made up of individuals who come from a range of backgrounds, including academics, health professionals, poverty and social justice advocates, producers, processors, labour experts and nutritionists. In its first year, the council established working groups to tackle four key issues: (a) school nutrition, (b) food insecurity, (c) food waste and (d) sustainable agriculture. Each group held hearings, hosted deputations and/or interviewed experts both within and outside government, and prepared written and oral briefs for federal cabinet ministers. The CFPAC also co-convened one of Canada’s national food systems dialogues as part of Canada’s activities in the lead-up to the UNFSS. Key lessons from the first year of operations include the need to increase the participation of marginalised and vulnerable groups (in particular indigenous representatives), the need to reduce barriers to participation for equity-seeking groups, the need to align the CFPAC’s activities with the needs and priorities of government and the need to create a two-way dialogue between the CFPAC and members of government.

NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
CFPAC											

3. FORUM FOR THE AMERICAS ON AGRICULTURAL RESEARCH AND TECHNOLOGY DEVELOPMENT

Established in 1997, FORAGRO is a hemispheric mechanism for the discussion and mobilisation of agreements on research and innovation activities that impact the agrifood sector. FORAGRO’s Executive Committee includes representatives from the public and private sectors, academia, non-governmental organisations and small farmers’ organisations, and representatives of young researchers and woman farmers. The Technical Secretariat is hosted by the Inter-American Institute for Cooperation on Agriculture in Costa Rica. FORAGRO tackles regional challenges, working to strengthen its

5. THE JOINT RESEARCH CENTRE KNOWLEDGE CENTRE FOR GLOBAL FOOD AND NUTRITION SECURITY

The JRC is the European Commission’s science and knowledge service, employing scientists to provide independent research-based advice and support to EU policy. The JRC complements its research by ‘managing’ knowledge from other sources. This means, inter alia, collating and analysing data and communicating data to policymakers in a systematic and digestible manner. Emphasis is placed on co-design, in the spirit of partnership, with the directorates-general of the European Commission and/or EU Member States. The ‘food, nutrition and health’ nexus is one of ten priority focuses of the centre’s work. The JRC also supports a database of scientific knowledge, created specifically for policymakers by 20 different ‘knowledge services’. These resources are designed to be ‘one-stop shops’ in their respective areas, with the responsibility of informing policymakers of the latest relevant science in a transparent, tailored and concise manner. The Knowledge Centre for Global Food and Nutrition Security supports the JRC’s work and underpins the EU’s commitment to achieving food security and improved nutrition. It promotes policy dialogues; gathers, organises and makes accessible the most relevant information, data and tools; and analyses and synthesises available knowledge to build a shared understanding of facts.

NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
JRC Knowledge Centre for Global Food and Nutrition Security											

6. FOOD AND AGRICULTURE ORGANIZATION REGIONAL OFFICE FOR EUROPE AND CENTRAL ASIA

Food and agriculture challenges across the Europe and central Asia region involve coping with livestock diseases, improving the reliability of agricultural census data, enhancing standards around capture fisheries, managing obsolete pesticides and setting up protocols on food safety. The FAO’s presence across the region in 53 member countries and one member organisation (the EU) is coordinated by the Regional Office for Europe and Central Asia in Hungary. The FAO Subregional Office for Central Asia, located in Turkey, focuses on enhancing the sharing of expertise

and services among countries of the subregion: Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan, Turkey, Turkmenistan and Uzbekistan. One of the initiatives of the Regional Office for Europe and Central Asia focuses on transforming food systems and facilitating market access and integration. The FAO collaborates with development agencies, international financing organisations, civil society groups, industry, academic and research institutions, and member countries.

NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
FAO Regional Office for Europe and Central Asia											

7. REGIONAL STRATEGIC ANALYSIS AND KNOWLEDGE SUPPORT SYSTEM – AFRICA

An African regional initiative, ReSAKSS supports the Comprehensive Africa Agriculture Development Programme by providing policy-relevant data, facilitating dialogue among stakeholders, monitoring progress and strengthening mutual accountability processes at continental, regional and national levels. It functions as a multicountry network, structured around four 'nodes': one is Africa-wide and three are regional economic communities (East and Central Africa, West Africa and Southern Africa). Each node comprises a network of partners that monitors regional and national progress towards Comprehensive Africa Agriculture Development Programme goals using joint indicators, facilitating inclusive and regular agricultural joint sector reviews across the continent. Recently, ReSAKSS broadened its scope beyond agriculture to include nutrition, climate change and gender issues. The initiative provides accountability systems for members committed to action on food security, nutrition, climate adaption and mitigation, and the empowerment of woman and smallholder farmers. The ReSAKSS annual conference, co-organised with IFPRI, the African Union Commission and the African Union's New Partnership for Africa's Development Planning and Coordination Agency, provides opportunities for high-level dialogue and information sharing. ReSAKSS also engages in demand-driven analytical capacity building, and produces regular outlook reports.

NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
ReSAKSS											

8. FUTURE AGRICULTURES CONSORTIUM – AFRICA

The Future Agricultures Consortium is an Africa-based alliance of research organisations seeking to influence policymakers through high-quality and independent information and advice to improve agricultural policy and practice. It prepares scoping papers on key topics, undertakes country analyses to identify constraints limiting agricultural growth, analyses local policy processes and organises scenario workshops. While the secretariat is housed in the United Kingdom, all work is organised within Africa’s three regional economic communities. Each regional hub supports a network of national, regional and international partners that provide academically robust, policy-focused research and advice on agricultural policy processes. The hubs support the Comprehensive Africa Agriculture Development Programme of the African Union Commission through research and facilitated dialogue. The Future Agricultures Consortium has created a large stakeholder network in Africa and has had an impact on public opinion through participation in workshops, media engagement, publications, etc.

SPI NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
Future Agricultures Consortium Agricultures Africa											

9. INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS – SOUTH-EAST ASIA CENTRE

The International Service for the Acquisition of Agri-biotech Applications (ISAAA) is a not-for-profit organisation promoting the use of agricultural biotechnology for smallholder

farmers. It mainly works through public–private partnerships, focusing on crop-specific solutions for sustainable agriculture. The regional centre for South-East Asia, established in 1998 in the Philippines, works with Bangladesh, China, India, Indonesia, Japan, Malaysia, Pakistan, Sri Lanka, Thailand and Vietnam. The objective is to support policymakers and other stakeholders with information to enhance understanding of biotechnology in agriculture. This includes maintaining a database of approved crops, producing annual reports about the state of biotechnology applications in agriculture, including case studies on applications, and organising seminars and workshops. The group has a regional centre in Kenya and one for the Americas in the United States. The ISAAA is governed by a board with representatives from the public and private sectors. Activities are funded by donations and donor-supported specific projects.

SPI NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
ISAAA – South-East Asia centre											

10. ASSOCIATION OF INTERNATIONAL RESEARCH AND DEVELOPMENT CENTERS FOR AGRICULTURE

Founded in 2013, AIRCA is a network of seven international agricultural research and development centres that address global challenges related to food and nutrition security: the World Vegetable Center (Taiwan), the International Centre of Insect Physiology and Ecology (Kenya), the Centre for Agriculture and Bioscience International (United Kingdom), the International Center for Biosaline Agriculture (United Arab Emirates), the International Centre for Integrated Mountain Development (Nepal), the International Fertilizer Development Center (United States) and Crops for the Future (United Kingdom). The association has a rotating secretariat, with each centre’s director-general chairing for 1.5 years. AIRCA members have offices in 33 countries and employ more than 2 000 people who work on innovations contributing to diverse, safe, nutritious and climate-resilient food systems to improve health, livelihoods and the environment. AIRCA publishes in international scientific journals, and reports and manages a searchable database (<https://www.cabi.org/airca>) of key publications by member organisations to make abstracts and, whenever possible, the corresponding full texts or links to the full texts freely available. Member countries have worked on policy-focused research and have provided advice to various governments.

NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
AIRCA											

11. OUR LAND AND WATER NATIONAL SCIENCE CHALLENGE – NEW ZEALAND

This government initiative supports the production and productivity of New Zealand’s food sector, while maintaining and improving the quality of the country’s land and water for future generations. This initiative works with central and local governments (plus industry and other stakeholders) to co-design research priorities, co-develop research (e.g. targeted catchment areas under land use pressure) and co-produce outputs (e.g. policy white papers). This mission-led research is designed to deliver impact (measured in terms of improvement in production and productivity while maintaining and improving land and water quality). Researchers involved in this initiative meet with central government quarterly to ensure that identified priorities are being met and progress is on track.

NAME	Food system components						Food system outcomes				
	SYSTEMS SUPPORTING FOOD PRODUCTION	FOOD SUPPLY CHAINS	CONSUMER BEHAVIOR	DIETS	FOOD SYSTEMS (APPROACH)	FOOD ENVIRONMENT	FOOD SAFETY	FOOD SECURITY & NUTRITION	ENVIRONMENT	SOCIAL JUSTICE	ECONOMIC OUTCOMES
Our Land and Water National Science Challenge											

12. THE CHINA CENTER FOR AGRICULTURAL POLICY

The China Center for Agricultural Policy (CCAP), which was established in 1995 at the Chinese Academy of Agricultural Sciences and moved to Peking University in 2016, comprises a group of more than 60 researchers dedicated to improved agricultural policy, agricultural research and development policy, food economics and rural development. The Agricultural Policy Analysis and Decision Support System Program is the core research group that links and

ANNEX 2: SUMMARY SUMMARY ASSESSMENT OF SELECTED GLOBAL AND REGIONAL INSTITUTIONS AND NETWORKS

EXISTING SCIENCE–POLICY INTERFACE OR MECHANISM	FUNCTION 1: ENGAGE STAKEHOLDERS THROUGH DIALOGUE	FUNCTION 2: BUILD CAPACITY	FUNCTION 3: ENSURE ACCESS TO DATA	FUNCTION 4: USE MODELLING, FORECASTING AND SCENARIOS	FUNCTION 5: DELIVER INDEPENDENT ASSESSMENT REPORTS	FUNCTION 6: CREATE A FORUM FOR DIPLOMACY
<i>Minimum requirements for effective functions supporting food system transformation</i>	A secretariat or interlocutor function is empowered to host dialogues, engage with stakeholders across the spectrum, work at local level, push out public-facing material and create a two-way conduit of engagement from the grassroots up to the multilateral level.	The institution/network helps to build capacity among different stakeholders to enable them to contribute to dialogues, interpret data and ensure their voices are included in standard/target setting.	This refers to a publicly accessible portal such as FAOSTAT, but it should have the ability to disaggregate data at least by gender. It must include private sector data and material on health and nutrition.	This refers to a global network of research stations that have the capacity to build, test, validate and run models and to host forecasting exercises (such as the IPCC has through the Climatic Research Unit, the Met Office Hadley Centre, etc.).	The institution/network has the capacity to produce independent and regular reports covering the entire food system.	This refers to an entity, network or mechanism with legitimacy to engage participating countries, policymakers, etc. to build consensus and set targets.
FAO	Formally, the FAO has country representatives; therefore, it is present all over the globe. However, administrative burdens and funding constraints hamper their ability to engage with a plurality and diversity of stakeholders.	Significant efforts have been made at global and national levels to enhance capacity for data collection and analysis, policy uptake of technical assistance, etc.	FAOSTAT's ability to disaggregate data subnationally (e.g. by gender and small administrative units) is limited. It produces few data on diets, nutrition or the environment. Data do not include private sector sources.	The FAO's ability to forecast or develop models is limited. Some 'over the horizon' reports are published but they are not systematic or regular.	The FAO's State of food security and nutrition in the world report moves in this direction but may or may not be scientifically independent.	The FAO regularly hosts dialogues with other governance agencies (such as the EU). The FAO has legitimacy and authority in this respect.
IPCC	Engaging stakeholders is not among the IPCC's core activities. However, its outputs have the effect of engaging policymakers directly and indirectly to generate dialogue across scales and geographical regions.	The IPCC undertakes limited formal capacity building but extensive informal capacity development through engagement with national scientists in high-level processes focused on data quality assessment and interpretation.	The IPCC does not have the capacity to do this, especially with regard to food systems.	This is what the IPCC is set up to do.	The IPCC produces regular assessment reports. However, its remit does not include food systems, although climate change is related to food systems in a number of ways.	Assessments, briefs for policymakers and special reports generate dialogue and attract public interest. However, the IPCC does not focus on food system sustainability directly.

EXISTING SCIENCE-POLICY INTERFACE OR MECHANISM	FUNCTION 1: ENGAGE STAKEHOLDERS THROUGH DIALOGUE	FUNCTION 2: BUILD CAPACITY	FUNCTION 3: ENSURE ACCESS TO DATA	FUNCTION 4: USE MODELLING, FORECASTING AND SCENARIOS	FUNCTION 5: DELIVER INDEPENDENT ASSESSMENT REPORTS	FUNCTION 6: CREATE A FORUM FOR DIPLOMACY
IPBES	The IPBES is similar to the IPCC in this function, but has a smaller scope and scale of reach.	The IPBES' 2030 work programme includes 'building capacity' as one of its six objectives. IPBES capacity building enhances knowledge and the skills of institutions and individuals to facilitate engagement in the production and use of its products. This is seen as a core aspect of strengthening the SPI for biodiversity and ecosystem services.	It provides access to journal articles and reports, but not to datasets.	Focusing on 2030, it has a work stream on strengthening SPIs for biodiversity and ecosystem services. This includes addressing interlinkages between biodiversity, water, food and health.	The IPBES is similar to the IPCC in this function, but is smaller and not as focused on food systems. Both the IPBES and the IPCC were established under the UN charter and are run by independent scientists.	The IPBES is similar to the IPCC in this function, but is smaller, with a secretariat hosted by the UNEP. It has a Multidisciplinary Expert Panel that provides advice to the plenary on scientific and technical issues.
HLPE on Food Security and Nutrition of the CFS	The HLPE does not have the legitimacy to engage with stakeholders (the CFS has this mandate). In the future, SPSIs must have the means, legitimacy and outcomes/substance to engage with national and subnational stakeholders.	It does not carry out formal capacity-building activities, but undertakes informal development through engagement with national scientists engaged in writing reports and peer review.	The HLPE highlights and draws attention to other data sources.	The HLPE's ability to 'look into the future' is insufficient. Report 15 (HLPE on Food Security and Nutrition, 2020) does this to some extent, but it is not carried out systematically. Every 4 years, the HLPE is tasked by the CFS to identify critical and emerging issues, but these are generally framed on the basis of the present.	In the future, SPSIs must provide much more holistic, systemic and comprehensive assessments.	The HLPE has a strong ability to foster dialogue among policymakers, but in the future SPSIs must engage broader audiences.
SCAR	Stakeholders are regularly involved in the foresight exercise.	Capacity building is performed through joint activities between Member States.	SCAR draws attention to other data sources.	Five foresight exercises were carried out between 2013 and 2021.	The only regular report is a foresight exercise but there are many science-policy discussions.	SCAR plenary meetings bring together delegates from all EU Member States, as well as some from candidate countries and states associated with the EU. Member countries are also represented in SCAR working groups.

EXISTING SCIENCE-POLICY INTERFACE OR MECHANISM	FUNCTION 1: ENGAGE STAKEHOLDERS THROUGH DIALOGUE	FUNCTION 2: BUILD CAPACITY	FUNCTION 3: ENSURE ACCESS TO DATA	FUNCTION 4: USE MODELLING, FORECASTING AND SCENARIOS	FUNCTION 5: DELIVER INDEPENDENT ASSESSMENT REPORTS	FUNCTION 6: CREATE A FORUM FOR DIPLOMACY
EFSA	The EFSA has the flexibility to undertake scientific work to support its own initiatives, in particular examining emerging issues and new hazards. It works closely with national authorities and food safety agencies of EU Member States and with scientific panels and a scientific committee, appointed through an open selection procedure.	The EFSA plays a key role in building the capacity of national food safety authorities.	The EFSA sets database standards and interoperability requirements across chemical monitoring, food composition and food safety risks.	While risk assessment is core to the EFSA's work, predictive modelling of future scenarios is limited.	The EFSA reports on risk in the food sector. This activity is carried out upon request by Member States or the European Commission.	A body of the EU, it has legitimacy to establish standards for Member States. Its board is appointed by the Council of the EU.
SAM & SAPEA CONSORTIUM	Many scientific and policy stakeholders are involved in scoping exercises, scientific reviews, expert workshops, public hearings and policy convenings.	SAM and the SAPEA consortium hold regular conferences and publish annual reports to disseminate knowledge.	They have transparent processes and provide access to reviews and reports but not to data.	The focus is on actual and potential policy leverages of relevance to most Member States of the EU. Formal foresight activity is not typical.	They have produced one body of work on sustainable food systems (2020) and others on aquatic sources of food and the health effects of climate change and of pandemics.	SAM provides independent scientific advice to the European Commission to inform policymaking. SAPEA is a consortium of the most important EU scientific academies.
CODEX ALIMENTARIUS	The Online Commenting System enables stakeholders to insert, share and submit comments on documents and enables secretariats to compile comments in an easy and efficient manner ('with the click of a button') and provide data for analysis.	Codex Alimentarius supports periodic training to strengthen technical capacity of subcommittees and national committees. The Codex Secretariat organises regular training for the chairpersons of government committees.	Codex Alimentarius sets standards for nearly 200 food products and has over 120 guidelines and codes of practice on a vast range of issues linked to food safety, quality and trade.	The 2020-2025 strategic plan presents the mission, vision, goals, objectives and measurable indicators for Codex Alimentarius.	The work of Codex Alimentarius and its discussions and new agreements are reported annually.	A multilateral body under the UN, Codex Alimentarius works through its commission to help member countries agree food standards and specifications, food trade concerns, health issues, etc.

EXISTING SCIENCE-POLICY INTERFACE OR MECHANISM	FUNCTION 1: ENGAGE STAKEHOLDERS THROUGH DIALOGUE	FUNCTION 2: BUILD CAPACITY	FUNCTION 3: ENSURE ACCESS TO DATA	FUNCTION 4: USE MODELLING, FORECASTING AND SCENARIOS	FUNCTION 5: DELIVER INDEPENDENT ASSESSMENT REPORTS	FUNCTION 6: CREATE A FORUM FOR DIPLOMACY
EEA	The EEA systematically involves stakeholders in reports. These reports are intended to support environmental management processes, environmental policymaking and assessment, as well as citizen participation.	The EEA has a key role in creating environmental information systems through a network of hundreds of organisations across Europe.	Data available include monitoring indicators on agriculture, soil, water, biodiversity and environmental impacts on health. Data on food or food systems are not available.	Several forecast studies, often estimates of scenarios of impacts of environment change, have been carried out.	The EEA produces numerous, frequent reports on a wide range of topics related to the environment.	A body of the EU, the EEA provides independent analyses for implementing and evaluating environmental policy but also for the general public. The EFSA collaborates with the European Environment Information and Observation Network and its 32 member countries to gather data and produce assessments on a wide range of topics.
JRC of the European Commission	The JRC has over 200 operational cooperation agreements and is an active player in the global arena, bringing together partners working on a diverse range of scientific fields worldwide.	The JRC provides open access to its research facilities and organises annual workshops and training to provide scientific and technical support to EU policymaking.	The JRC makes tools and databases available, and provides free digital access to a publications repository of science-for-policy reports, articles, technical reports and other scientific outputs.	The JRC contributes to foresighting. It supports EU policymaking by providing strategic and future-oriented input, by developing an anticipatory culture inside the European Commission and by continuously experimenting with methods and tools to make foresight practically useful for decision-making processes.	The JRC carries out activities in 10 scientific areas, including 'food, nutrition and health' and 'environment, resource scarcity, climate change and sustainability' (which includes food security).	The JRC is the European Commission's science and knowledge service, providing scientific evidence throughout the whole policy cycle.
EAT	It engages stakeholders from academia, the private sector, farmers' organisations and policymakers, but there are no regular reports.	EAT works closely with individual governments to enhance policymakers' and young professionals' capacities to engage with science.	Access to data is very limited.	It works with other academic institutions and scientific networks for forecasting, modelling and scenario building related to food systems.	EAT-Lancet Commission work is hugely influential. EAT has worked with the Food and Land Use Coalition and with the Food System Economics Commission on separate analyses and reports.	A science-based non-profit organisation that operates as a global platform for food system transformation through dialogues, engagement with policymakers and donors and promotion of research.
FUTURE AGRICULTURES CONSORTIUM	Independent researchers at the Future Agricultures Consortium facilitate discussions relevant to African food systems among stakeholders, including representatives from academia, government, media and the private sector. Discussions provide input into research.	The Future Agricultures Consortium provides a forum for dialogue and debate between different stakeholder groups. It uses the outcomes of the discussions as an input in its policy advice.	Reports, books and policy briefs are available, but no datasets are available.	Some projects include scenario modelling related to specific issues.	It does not provide regular assessment reports.	The work of the Future Agricultures Consortium has an impact on policymaking through (a) direct influence on policymaking processes, (b) a forum for dialogue and debate, and (c) encouraging others to be catalysts in policy debates and alliances.

EXISTING SCIENCE–POLICY INTERFACE OR MECHANISM	FUNCTION 1: ENGAGE STAKEHOLDERS THROUGH DIALOGUE	FUNCTION 2: BUILD CAPACITY	FUNCTION 3: ENSURE ACCESS TO DATA	FUNCTION 4: USE MODELLING, FORECASTING AND SCENARIOS	FUNCTION 5: DELIVER INDEPENDENT ASSESSMENT REPORTS	FUNCTION 6: CREATE A FORUM FOR DIPLOMACY
MILLENNIUM ECOSYSTEM ASSESSMENT (2001–2005)	The board included representatives of the Convention on Biological Diversity, the UN Convention to Combat Desertification, the Ramsar Convention and the UN Convention on Migratory Species; national governments; UN agencies; civil society representatives; and the private sector. A large group of social and natural scientists was involved in the assessments.	Several stakeholder dialogue meetings were held, and these efforts resulted in reports. However, capacity building was not the goal.	Access to data was very limited.	The scenarios work involved data collation and analyses, as well as multiple reports. There is no ongoing work.	A scenarios working group generated research on ecosystem services by developing four global scenarios. A series of reports involved 1 360 experts worldwide.	The Millennium Ecosystem Assessment was established in 2000 to foster dialogue through workshops and promote research around future changes in drivers, ecosystems, ecosystem services and human well-being.
Global Forum on Agricultural Research and Innovation (GFAR)	Stakeholder engagement is key, promoting collective actions that connect farmers and agricultural workers; civil society and non-governmental organisations; consumers; education; finance and investment institutions; UN agencies; national and international research centres; advisory services; private sector companies; women's groups; and youth organisations.	GFAR has contributed by sharing information across its networks through events, through website-based information sharing and by facilitating the creation of spaces to support innovation and research collaborations at various levels.	Documents and a selection of datasets on agriculture made available by partners are accessible to all. No data on food systems are provided.	GFAR channels information and fosters interaction among its members. It has no formal forecasting responsibilities or ambitions.	GFAR promotes knowledge sharing, dialogues and investments to build partnerships, capacities and mutual accountability at all levels of the agricultural system. The aim is to ensure that agricultural research will meet the needs of resource-poor end users.	GFAR is a network mechanism with a secretariat hosted by the FAO. It fosters dialogue with 660+ partner organisations.
Food and Land Use Coalition (FOLU)	The country platforms of FOLU regularly engage with country stakeholders. However, FOLU covers only some countries, such as China, Colombia, Ethiopia, India, and Indonesia.	Capacity building is limited to peer-to-peer sharing of research and experience.	Access to data is very limited.	FOLU is working with IFPRI, the International Institute for Applied Systems Analysis and others on forecasting and scenario building on food systems-related issues (land use, GHG emissions, etc.).	Independent assessment reports are ad hoc. It produces influential reports; its engagement with stakeholders worldwide is relevant, given its adoption of the principles of food system thinking.	More than 10 global and regional ambassadors engage with stakeholders. However, there are no formal dialogues between FOLU and national stakeholders.

EXISTING SCIENCE-POLICY INTERFACE OR MECHANISM	FUNCTION 1: ENGAGE STAKEHOLDERS THROUGH DIALOGUE	FUNCTION 2: BUILD CAPACITY	FUNCTION 3: ENSURE ACCESS TO DATA	FUNCTION 4: USE MODELLING, FORECASTING AND SCENARIOS	FUNCTION 5: DELIVER INDEPENDENT ASSESSMENT REPORTS	FUNCTION 6: CREATE A FORUM FOR DIPLOMACY
ReSAKSS	ReSAKSS engages widely with regional and country-level policymakers. However, its engagement with the private sector, civil society and farmers' organisations is limited.	Capacity building is limited to engaging policymakers in dialogues about research findings.	ReSAKSS plays an important role in generating, collecting, and sharing data, indicators and analyses related primarily to Africa and, to some extent, South-East Asia (ReSAKSS Asia).	It works with IFPRI on forecasting and scenario building and on monitoring and identifying trends.	It produces annual reports to track and monitor agricultural spending, agricultural growth and other indicators related to agricultural and rural development.	ReSAKSS supports the African Union and national governments by mobilising support for agriculture through conferences, dialogues, capacity building and peer-review mechanisms.
International Assessment of Agricultural Knowledge, Science and Technology for Development (2006–2010)	There was good collaboration among agricultural scientists to develop the world agriculture report. This involved 400+ scientists from all continents and a spectrum of disciplines. However, there was minimal engagement with other stakeholders beyond presentation meetings.	Capacity building was limited; this was not part of its remit.	The main report and related briefs are accessible, but no dataset is available.	There was no forecasting other than basic scenarios in the main report.	The goal was to work through multiple One CGIAR institutes to facilitate the dissemination of agricultural knowledge, science and technology and to build capacity for the use of such knowledge.	This was an international donor-supported project that sought to improve access to agricultural knowledge and promote sustainable agricultural practices.



ANNEX 3: SUMMARY OF INSIGHTS FROM THE ARAB REGION FOCUS GROUP DISCUSSION

On 2 March 2022, leading experts from the Arab region convened to discuss existing platforms for policymaker–scientist engagement in the region, their current status, challenges, barriers and enablers, and recommendations of ways forward. International, regional and national organisations were represented, including national research centres and government bodies with mandates related to food and nutrition security. For the purpose of this discussion, van den Hove’s (2007, p. 815) definition of SPIs was adopted, whereby these represent ‘social processes which encompass relations between scientists and other actors in the policy process, and which allow for exchanges, co-evolution, and joint construction of knowledge with the aim of enriching decision-making’.

MECHANISMS SUPPORTING INTERACTIONS BETWEEN SCIENTISTS AND POLICYMAKERS IN THE ARAB REGION

At national level, research centres are active on different aspects pertaining to the food system. The capacity of existing platforms or mechanisms differs from country to country. Some countries have strong national institutions carrying out research and advising the national government. Morocco was identified as a country with a more advanced system for communicating policy-relevant research, where country policies and strategies are adopting national-level circular economy approaches and agroecological production practices such as no-till farming, intercropping and the preservation and utilisation of national genetic resources, all of which are contributing to improving food and nutrition security.

Nevertheless, many weaknesses exist. These became clear during the COVID-19 pandemic, which uncovered substantial gaps in research and data at all levels: risk assessment, production and integration of systems from point of entry all the way to consumption. These gaps are particularly important given the different challenges that constrain local food production capacity in the region, where severe water scarcity and enormous pressures on the natural resource base, coupled with low agricultural productivity, rising aridity caused by climate change and an increasing population, have led to a significant reliance on food imports.

Regional platforms also operate in the Arab region. These include, but are not limited to, international organisations such as FAO regional offices, the UN Economic and Social Commission for West Africa and the International Center for Agriculture Research in the Dry Areas, and regional entities such as the Gulf Cooperation Council, which focuses on policies to facilitate importation and transportation of food commodities. There are also regional platforms initiated by scientists, such as the Mediterranean Network on Circular Food Systems led by Mohammed VI Polytechnic University in Morocco, which addresses gaps related to circular food systems, nutrition and health security, and rising levels of unused organic waste.

CONSTRAINTS ON / BARRIERS TO IMPROVED SCIENCE ENGAGEMENT WITH POLICY ACTION IN THE ARAB REGION

There has been good progress in the region, but more is required to start working in a systemic way and make the food system more sustainable, resilient and equitable. The shift in thinking from a food security perspective to a sustainable food system perspective is not fully understood, integrated or adopted in the region. The limited understanding of ‘food systems’ and their components, elements, drivers and interactions has affected the effectiveness of the regional and national dialogues, including the UNFSS dialogues. As a result, the outcomes and recommendations in this region have not been well focused. The food system is currently viewed to a large extent as an issue separate from climate change, disaster risk reduction and green growth / circular economy, and in many cases is disconnected from food security.

Some initiatives have sought to introduce a nexus approach, especially to agriculture and water issues, but these initiatives are at a preliminary stage and much more still needs to be done. Moreover, most countries in the region do not have a well-defined entity responsible for food systems/security, and initiatives are spread across different entities. When these entities work in silos, progress is hindered.

In general, decision-makers base their decisions on politics rather than evidence. There is a lack of knowledge about food systems, as mentioned previously, but also limited data. Assessments of food systems’ environmental and social impacts or their economic benefits are rare. No database exists, and there are gaps in evidence across all food system components and outcomes. When data are available, they are not consistent, nor are they monitored and updated regularly.

Data gaps regarding food supply chains became clear during the pandemic, as the Arab region relies heavily on imported food. A positive outcome of the pandemic is the growing awareness of the need to understand the region’s food system and all its components to ensure future food and nutrition security. Nonetheless, gaps persist, and capacities and implementation are inconsistent across countries.

Diet is a significant problem, as evidenced by rising overweight and obesity problems. There is a need to change consumer behaviour in the region, but no clear roadmap of interventions and entry points. Some initiatives to revive national and traditional diets were very helpful in some countries in alleviating the food supply challenges during the pandemic. Other major issues in the region include water scarcity and high levels of food loss and waste. Conflict in the region is a major hindrance: displacement, non-working national systems, and inability to open borders and collaborate exacerbate the challenges of making decisions based on evidence.

ENABLERS OF IMPROVED ENGAGEMENT ACROSS THE ARAB REGION

There are positive signs in the region, starting with the high priority that governments are placing on food security in the aftermath of the pandemic, which exposed the vulnerability of supply chains and the substantial data gaps. The conflict between Russia and Ukraine, given the significant reliance on imported grains from those countries, is expected to move that priority even higher on the policy agenda. Thus, there is political will and openness, but this needs to be followed with a clear action plan that identifies priorities and allocates resources.

The recent shift in discussion from food security to nutrition security in the light of growing malnutrition in the region and food-related health problems is not yet facilitating interventions based on solid evidence and a systemic approach.

There are sufficient human and financial resources available to set up a resilient infrastructure, with adequate support from politicians. In this respect, it would be important to generate data that demonstrate cost-effectiveness to prompt decision-makers to act at national level, as illustrated by emerging successes in Morocco, Qatar and the United Arab Emirates.

Growing interest in North Africa regarding circular food systems as a way to deal with the growing organic waste problem and to address the nutrition and health security priority has prompted the launch of the Mediterranean Network on Circular Food Systems led by Morocco, which has attracted other countries to join, such as Greece, Spain and Tunisia. Another existing powerful regional platform is the Gulf Cooperation Council, which focuses on policies that facilitate food importation and transportation of commodities but could be a useful platform for future food system transformation.

Regional organisations with connections to bodies such as the FAO, the UN Economic and Social Commission for West Africa and the International Center for

Agriculture Research in the Dry Areas are also enablers because they introduce global frameworks and fill gaps at national level by providing missing evidence.

RECOMMENDATIONS FOR WAYS FORWARD

- It should be ensured that SPSIs respect the local context and build on progress already made. This includes utilising the assets resulting from the UNFSS in the form of national dialogues; prompting and encouraging peer learning within the region; supporting a better understanding of local food systems and their connections with food and nutrition security; and having regular meetings to exchange information. Concurrently, it is important to build an appreciation of the need to adopt a systemic approach that utilises locally generated data and evidence and that fosters collaboration between all stakeholders, including civil society organisations.
- Capacity building is an important enabler, and there is a need to build qualified capacity at national level across the food system. Capacity is required to promote the adoption of a systemic approach, enhance technical expertise and produce good-quality data and evidence that can be turned into applicable advice. Regional and international institutions can play an important role in facilitating knowledge and skills transfer.
- Regional interactions and partnerships are critical enablers. These can be encouraged by establishing collaboration platform(s) that facilitate the imparting of knowledge from countries with more advanced systems and policies, joint research among scientists and students, and the opportunity for individuals from different countries to collaborate and learn from each other.
- There is a need to attract young people to the food sector by developing innovative technical fields that may interest them and by introducing higher salaries and incentives.
- Initiatives that provide reliable, trustworthy and timely data at national level should be developed. These data should be collected in a format that enables comparability (following standardised international protocols), especially in conflict areas, where it is very difficult to gather up-to-date data.
- Innovations, solutions and tools exist and need to be identified, taking into consideration their appropriateness for the region's conditions and creating an enabling environment for their upscaling. Enabling conditions include human and financial resources, as well as regulatory and policy frameworks. In the transition

in approach, it is important to evaluate the technologies using the lens of appropriateness to national conditions; hence, unconventional opportunities need to be evaluated (e.g. growing barley instead of wheat).

- The governance structures of evidence-generating organisations and of government organisations need to be improved. Academic and think-tank organisations require structures that facilitate learning; project development and management; approvals and procurement processes; data collection and analyses; and the preparation of policy documents for decision-makers. Government organisations need to adopt a systemic approach, create and enforce a facilitating regulatory environment and ensure that decisions are informed by evidence.



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The European Commission (EC) established a High-Level Expert Group (HLEG) to assess the needs and options for strengthening the science-policy interface (SPI) for improved food systems governance. The HLEG concludes that food system transformation must be better supported through more ambitious interlinked science-policy-society interfaces and recommends the following pathways: i) multilateral institutions must strengthen and adapt existing SPIs with additional resources and a broader mandate to engage across sectors and scales; ii) they should cooperate with member states to fund a series of dedicated taskforces to fill knowledge and data gaps; and iii) they should collectively invest in a global coordination hub to build capacity, convene regional assessments as well as forecast and model trends.

Studies and reports

